GREEN BUILDING IN CANADA

Assessing the Market Impacts & Opportunities

CANADA GREEN BUILDING COUNCIL • CONSEIL DU BÂTIMENT DURABLE DU CANADA

DelphiGroup
Environmental Strategies. Business Solutions.

Toronto and Region Conservation for The Living City

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Every Building Greener

Conseil du bâtiment durable du Canada
Verdir tous les bâtiments

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Project Sponsor

The Canada Green Building Council (CaGBC) is a not-for-profit, national organization that has been working since 2002 to advance green building and sustainable community development practices in Canada. Through its leading programs that include the Leadership in Energy and Environmental Design (LEED®) and in collaboration for its membership of over 1,200 industry organizations involved in designing, building, and operating buildings, homes, and communities, CaGBC has made excellent inroads toward achieving its mission of reducing the environmental impact of the built environment in Canada

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With Support From

Toronto and Region Conservation (TRCA) works with its partners to ensure The Living City is built on a natural foundation of healthy rivers and shorelines, greenspace and biodiversity, sustainable communities, and green infrastructure projects.

www.trca.on.ca

About the Researcher

As a pioneer in sustainability, environmental strategies, and business solutions, the Delphi Group has more than 25 years of experience helping some of Canada's best-known organizations improve their sustainability – as well as the local and global communities in which they operate. The Delphi Group brings a unique combination of policy expertise, strategic thinking, and technical know-how to every project, which has allowed it to work with a wide range of organizations, including 32 of the top 100 companies. The Delphi Group also works with some of Canada's largest and leading real estate and construction companies as clients.

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BENTALL KENNEDY

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US GREEN BUILDING COUNCIL

WINDMILL DEVELOPMENT GROUP

URBAN DEVELOPMENT INSTITUTE

PREFACE

This project assesses the market and employment impacts, as well as the core strengths and capabilities, of Canada's green building industry. Based on considerable secondary research and literature review, 35 industry stakeholder interviews, and a detailed, data-driven economic impact assessment, this project:

- Developed an overview of the current status of activities in Canada's green building sector, including an update on trends impacting the industry and a list of policy, program, and financial drivers;
- Quantified the size and scope of the green building sector in Canada (for both LEED® activities and the broader industry), including an estimation of the latest economic activity (in terms of GDP, employment, and market penetration); and
- Identified national green building industry capabilities, including the range of products and services, innovation, and core competencies of industry leaders.

This report is designed to:

- Capture the exponential growth of the industry and the measurable impact that the sector is having on the economic, social, and environmental fabric of Canada;
- Inform policy-makers by demonstrating the impact of the sector on jobs and regional / community benefits;
- Provide an overview of the evolution of the sector, current trends and market opportunities, costs, risks, and barriers to growth;
- Showcase the strengths and capabilities of Canada's green building industry in line with potential export opportunities and global markets; and
- Provide an overview of the current state of innovation and the potential for new and emerging technologies, materials, and practices / processes in line with regional, national, and global trends.

While covering a broader scope and range of activities than those under the direct mandate of the Canada Green Building Council (CaGBC), the research and information contained within this report is intended to support the accelerated market transformation to high-performing, healthy green buildings, homes, and communities across Canada.

EXECUTIVE SUMMARY

Green building is recognized globally as a method and practice for addressing climate change, minimizing energy and resource demands, and for building more resilient and healthy communities. Green building is driving innovation in service delivery and processes, product and technology design and manufacturing, and material and resource use.

This report provides an overview of the economic contributions of the green building sector in Canada. It profiles some of the leading trends and industry drivers, and showcases the impressive market transformation that is underway across the country. While research to date has largely focused on the environmental benefits of green buildings, less analysis has been dedicated to the sector's contribution to the broader Canadian economy. This study quantifies the economic value creation from green building in Canada, as well as the economic and market impact of the Canada Green Building Council's Leadership in Energy and Environmental Design (LEED®) program in terms of gross domestic product (GDP), jobs, and gross output.

Figure ES-1: National Green Building Economic Impact

NATIONAL GREEN BUILDING ECONOMIC IMPACT

In 2014, Canada's green building industry:

GENERATED

$23.45

BILLION IN GDP

SUPPORTED

297,890

DIRECT JOBS

The portfolio of LEED® buildings in Canada certified between 2005 – 2015 will:

GENERATE

$62.3

BILLION IN TOTAL GDP

over their lifetime
(direct, indirect, and induced)

CREATE

701,700

JOBS

over their lifetime
(direct, indirect, and induced)

PROVIDE

$128.0

BILLION IN GROSS OUTPUT

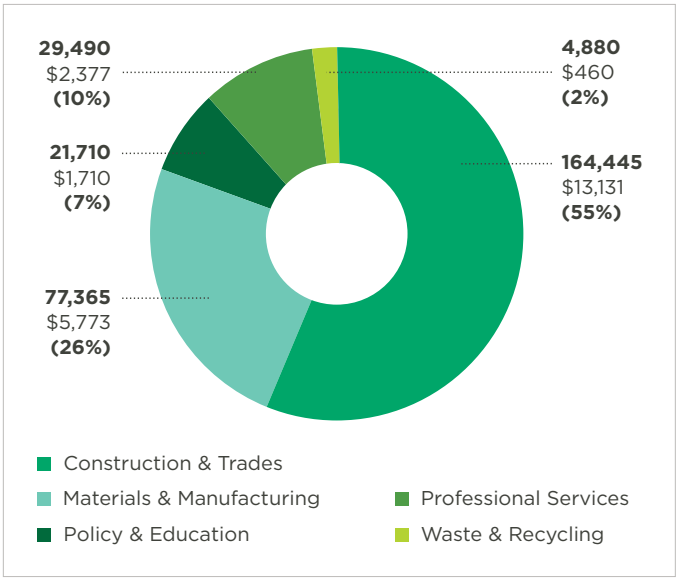
(direct, indirect, and induced)

Economic Impact of Canada's Green Building Industry

Green building growth in the commercial sector has been driven by building owners, institutional investors, and corporate sustainability policies; and by policy and building code / bylaw requirements in the institutional sector. Voluntary adoption played a major role in market uptake. This adoption was driven by a business case that demonstrated positive return on investment (ROI) over the life of green buildings. Findings from this study show that through direct and indirect benefits, green buildings are having a positive impact on new investments, job creation, and revenues for companies across the extensive value chain and full lifecycle of buildings.

In 2014, the green building industry was estimated to have employed 297,890 direct full-time workers in Canada and generated approximately $23.45 billion in GDP (see figure ES-1). For comparison, this represents more jobs than Canada's oil and gas extraction, mining, and forestry industries combined, which collectively employed approximately 270,450 workers in 2014.[1] Ontario and British Columbia generated more green building jobs as a percent of their total labour force in 2014 – equal to 2.1 percent and 1.6 percent respectively, due in part to greater market leadership, progressive building code requirements and green building policies.

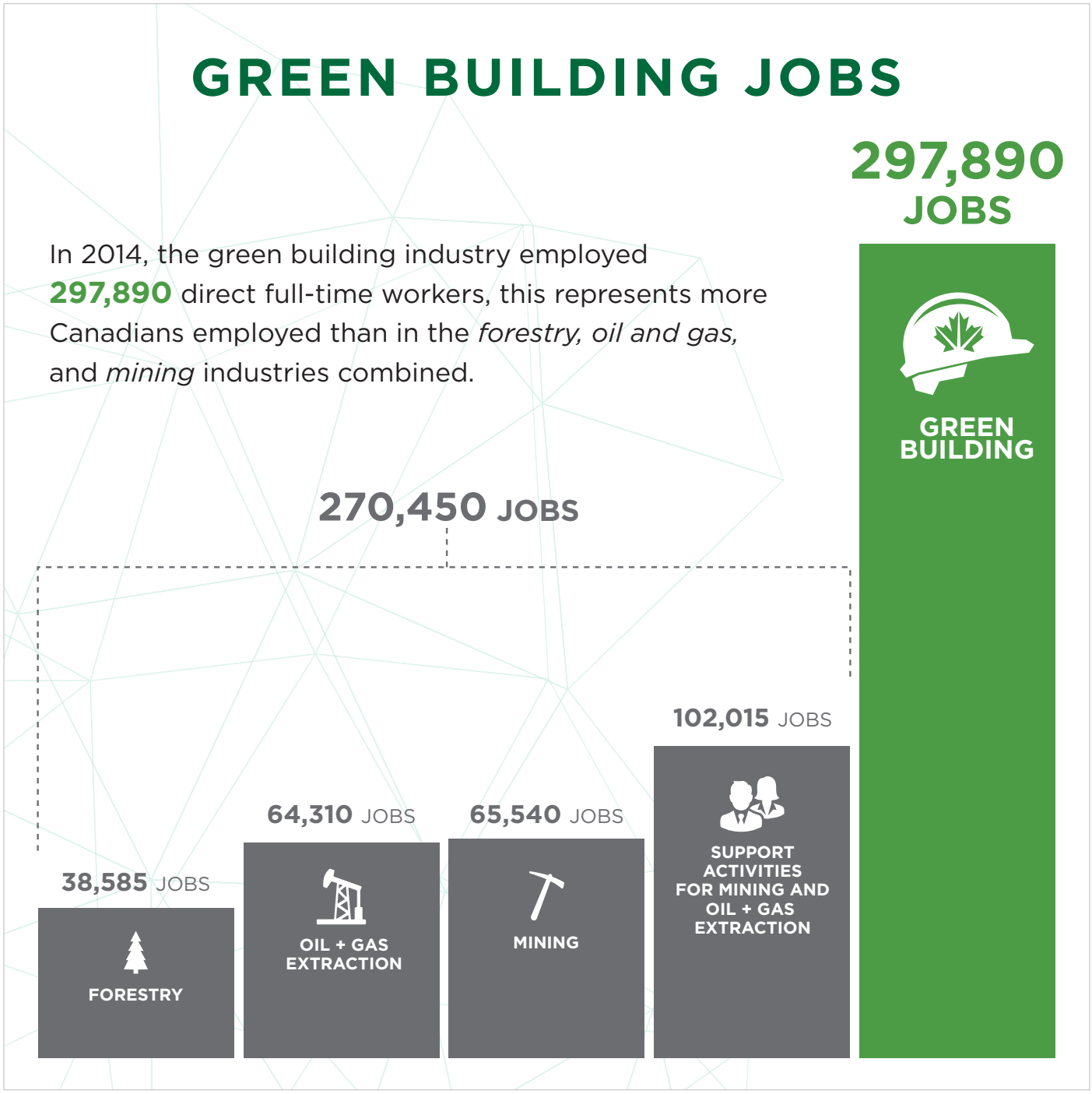
Figure ES-2: Green building jobs and GDP (millions of chained 2007$) by sector in Canada, 2014



Companies active in the Construction and Trades segment accounted for the largest percentage (55 percent) of green building employment and GDP in Canada, equal to approximately 164,445 jobs (approximately 13 percent of Canada's total construction work force) and $13.13 billion dollars in GDP (see figure ES-2). Jobs in this segment include contractors and trades engaged in the construction of residential and non-residential buildings certified under a recognized green building standard / certification or an energy efficient residential (Part 9) building based on building energy code requirements (equal to EnerGuide 80).

[1] Employment estimates for oil and gas, mining, and forestry industries come from Statistics Canada's Employment and Earnings Survey for 2014 (CANSIM table 281-0024). The estimate does not include jobs in processing or related value-add product sectors.

Figure ES-3: Green Building Jobs



Green Building Industry Growth

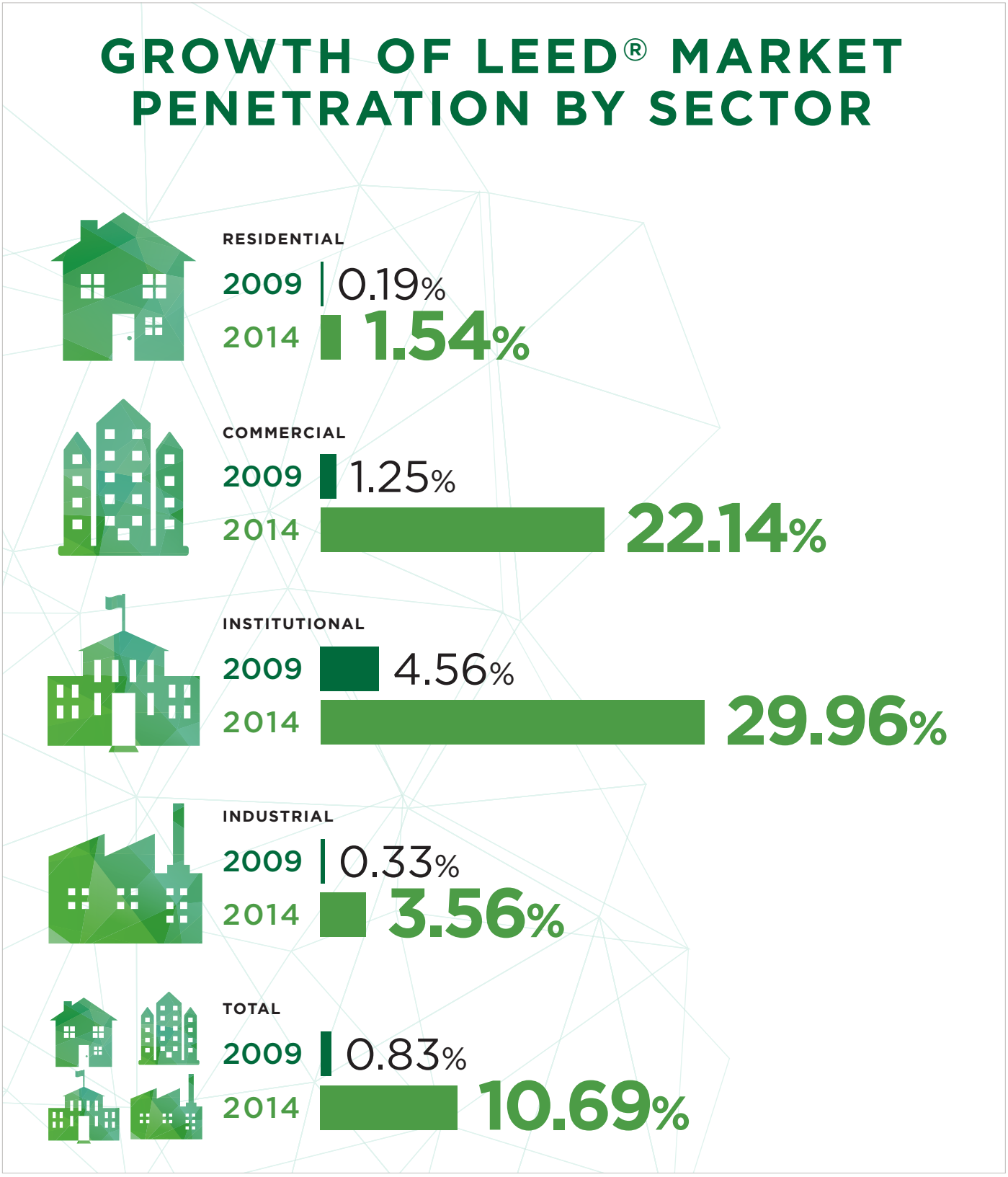
Green buildings are closely tied to standardized metrics defined by leading rating systems and certification programs such as LEED®, which has experienced rapid growth in Canada over the last decade. For example, from 31 certified buildings in 2005 to a cumulative total of 2,576 in 2015, LEED has seen enormous uptake across the country.

Furthermore, LEED certified building market penetration rates (as a percent of gross new construction floor space) have been growing over the last decade, reaching 22 percent penetration of all new commercial buildings and approximately 30 percent penetration of all new institutional buildings constructed in Canada in 2014 (see figure ES-4).

Across all asset classes, the market penetration of LEED certified buildings in Canada has increased from 0.8 percent for the period 2004 – 2009, to a present rate of 10.7 percent for all new construction floor space in 2014.

Following the introduction and successful market adoption of LEED, the first comprehensive green building rating system in 2002, other green building rating systems and third-party certification programs have been introduced in Canada for both the residential and non-residential segments. These include BOMA BESt, ENERGY STAR, Built Green, and Passive House. In Ontario, approximately 32 percent of all eligible Part 9 new homes were certified ENERGY STAR in 2014 with more than 62,000 homes having been labelled and over 80,000 enrolled.

Figure ES-4: Growth of LEED® Market Penetration by Sector



Economic Impact of LEED Building in Canada

Applying a lifecycle cost analysis (LCCA) methodology to LEED certified building projects in Canada, the overall economic contribution of the program since its inception was estimated in terms of jobs and GDP. Net lifecycle savings for LEED certified buildings were estimated based on a detailed review of 52 LEED project case studies in Canada. These case studies were selected in order to provide a representative sample of the portfolio of LEED certified buildings in Canada across all building types, certification levels, and provinces / territories.

In terms of the overall economic impact, it is estimated that LEED certified projects to date will generate approximately $59.1 billion in direct dollar gross output[2], $25.44 billion in GDP (in constant 2007 dollars[3]), and will create 329,912 direct jobs over the economic life time of these buildings, assumed to be 33 years (see table ES-1). When indirect and induced contributions are included, the overall economic impact from LEED projects to date over their lifetime will include $128.0 billion in gross output, $62.3 billion in total GDP, and will create 701,680 jobs.[4 5]

Table ES-1: Direct economic impacts generated from the LEED projects in Canada that have been certified in 2015 over their economic lifetime

	Residential	Commercial	Institutional	Industrial	Total
Direct Gross Output ($000, 2007$)	$3,732,418	$31,751,152	$22,575,694	$1,099,658	$59,158,923
Direct GDP ($000, 2007$)	$1,542,104	$13,689,746	$9,733,678	$474,126	$25,439,654
Direct Labour Income ($000, 2007$)	$1,198,371	$11,096,760	$7,890,015	$384,321	$20,569,466
Direct Jobs	19,366	177,897	126,488	6,161	329,912

[2] Gross output is a measure of an industry's sales, which can include sales to final users in the economy (GDP) and sales to other industries (intermediate inputs). Gross output can also be measured as the sum of an industry's value added and intermediate inputs.

[3] Construction costs were expressed in constant dollars in order to remove impacts from inflation. The constant dollar value (2007) is based on residential and non-residential construction deflators published in Statistics Canada Table 380-0102 Gross Domestic Product indexes, annual (2007=100).

[4] Direct impacts are related to the specific industry (in this case, green building), while indirect impacts relate to activities that support or supply the industry. Induced impacts are those that are a result of direct / indirect spending in the local economy outside of the green building industry (i.e. the economic as a whole). In general terms, industries with higher multipliers are more desirable.

[5] Note these are gross jobs; not net jobs. Net jobs reflect incremental jobs after shifts in the economy such as people moving from other construction activities are netted out.

Green Building Trends & Market Drivers in Canada

The green building movement in Canada over the last two decades has seen a significant shift from being primarily driven by market and policy leaders to greater synergies now emerging between regulation and industry practices. Leading trends and key industry drivers at the forefront of the green building market transformation in Canada are outlined in the table below.

Key Trends & Industry Drivers	Description
Growth of Reporting, Benchmarking & Energy Labelling	Real estate owners and property managers are increasingly taking a portfolio view to their building assets from a risk management perspective. They also compare the performance of buildings next to one another and to those of their competitors in order to attract and retain tenants and investors. As these practices become more standard across Canada, they will allow for better comparisons and a deeper understanding of building performance. This will allow a focus on designing more effective programs and related efforts to reduce environmental impacts and save on operational costs.
Growing Focus on Existing Buildings & Retro-Commissioning	Existing buildings comprise the majority of building stock and present significant opportunities for improvements. Recommissioning and retro-commissioning existing buildings will reduce energy consumption and GHG emissions, creating healthier indoor building environments, and attracting and retaining tenants.
Shift toward Community-focused Design Supporting Health & Wellbeing	Municipal planning is shifting toward urbanization, densification, better land-use policy, and a desire for more walkable, livable cities. This is causing a shift in design thinking from the individual building scale to more community-focused design. The benefits of community development are also becoming increasingly important to investors.
Movement toward Net Zero Energy Buildings	In designing to reduce energy usage and GHG emissions, buildings are dramatically changing in shape and form. This is underpinned by a greater focus on passive design features and building envelopes. Improvements in performance and decreasing costs for solar photovoltaics (PV) technology in the last several years has taken net zero that much closer to reality. The intersections evolving between solar PV, home energy storage (batteries), and plug-in electric vehicles are of interest to consumers, who are increasingly able to rely on low-carbon energy on the path to net zero.
Focus on Lowering Construction Costs & Improving Affordability	One of the biggest challenges and concerns within the building industry is the growing costs of construction. In addition to the rising costs of land, materials, and labour, increasing fees and taxes are resulting in a need to innovate and streamline processes. In collaboration with government and other stakeholders, industry has been working to improve energy performance, reduce construction and operational costs, and make homes and buildings more affordable for Canadians. Processes and technologies that are likely to be used more prominently in future include integrated design process (IDP), integrated project delivery (IPD), building information modelling (BIM), pre-fabrication, 3-D printing, and Lean Construction.

Canada's Green Building Strengths & Core Competencies

With a background in cold-climate science and construction expertise, Canada's green building industry has developed strengths in areas that include related engineering and design, quality home construction, and a range of energy-efficient / sustainable technologies and materials.

Canada is recognized for its design and related professional services (engineering, architecture, planning, and community infrastructure). Expertise in developing world-class building projects, as well as archetype buildings, has led to a better understanding of holistic, systems-based design in order to optimize performance. Leading Canadian firms have developed strengths in air-tightness, building envelope design, and building science. At the same time, while there are many small and mid-sized firms responsible for some of the most leading edge designs at a provincial level, there are still very few companies that operate at a national or global scale.

Historically, Canada has been an exporter of commodity-based natural resources (e.g. convention lumber products) rather than value-added products and technologies. Over the last decade, there has been a holistic and strategic approach from all levels of government and industry to enable Canadian companies to become leaders in engineered wood products (e.g. cross-laminated timber) and related building design / engineering. Canada also has growing expertise in building pre-fabrication and related components and processes.

Many Canadian companies are now developing advanced green building materials and energy efficient technologies that are being exported internationally. These include heating technologies (such as heat exchangers and heat / energy recovery ventilation systems, heat pumps, high-efficiency boilers, and drain water heat recovery), renewable energy systems (including geothermal and solar), energy management and building controls, and high-performance windows and building envelope technologies.

Global Competitiveness of Canada's Green Building Industry

On the strength of certain niche technologies, innovative standards, and leading-edge research, Canada has seen international success in the green building space in the face of stiff competition from Europe, Asia, and the US.

Low domestic market adoption within certain building asset classes and in some provinces is still an issue, in part because the policies and regulations in those provinces do not adequately support green building. The diversity of different policies across the country means that while some provinces are adopting green building faster than others, there is a disincentive for firms to expand outside their local area. As such, few Canadian green building firms compete internationally. In addition, the lack of federal supporting policies and programs (including investment in R&D) imposes barriers to domestic growth. Nominal investment in R&D and innovative technology and product development has resulted in Canada ranking only slightly above the global average in terms of its green building industry's competitive positioning.

While expertise in energy efficiency practices and technologies have developed in Canada, the relatively inexpensive cost for energy and electricity has somewhat lowered the impetus for action and consumer demand. This is unlike Europe and other jurisdictions where higher energy prices are driving market demand and industry development. As a result, Canadian companies tend not to export their energy-saving technologies and green building services to market leading countries in Europe but focus on markets where they have a competitive advantage. These include the United States, certain countries in Asia, and Latin America.

Accelerating Industry Growth & Maximizing the Economic Opportunities

In order to accelerate the growth of Canada's green building industry and maximize the economic and employment benefits, there is a need to address existing challenges and capitalize on the opportunity areas outlined below.

Opportunity Areas	Summary
Investing in Research & Innovation	The construction sector in Canada ranks at the bottom of all industries in terms of its expenditures in research and development (R&D). Consequently, due to a lack of innovation, productivity levels have suffered over time. Wood-related technologies (e.g. windows, insulation) and some value-added construction products show particular promise. On the materials side, circular economy, cradle-to-cradle, and biomimicry concepts indicate a potential for being integrated into practice in order to optimize resources and minimize waste. Greater federal and provincial government support for green building on the research and innovation agenda would help, with specific focus on both economic and export development.
Addressing the Gap between Design & Performance	The building performance gap is partly a design and modeling issue, as well as an operational issue as disconnects often exist between the two groups. The gap also presents a growing problem for builders with contracts that increasingly include penalties for not meeting performance requirements.[6] The Integrated Design Process (IDP) is helping here to some degree but there is room for improvement. In order to go further, design will have to fundamentally focus on the building envelope and the entire building-as-a-system approach. Greater standardization of energy modelling in Canada, as well as investment in supportive training for modelers would stimulate a focus on the building envelope and building-as-a-system approach, allowing design teams achieve greater end-use performance. On the operational side, there is a necessity for a more consistent approach to benchmarking of performance, post-occupancy evaluations and for taking an evidence-based approach to green building that has a focus on energy and data analytics to help move from information to intelligence. This also includes improved training for building operators.
Focusing on Asset Planning	A significant requirement exists for better building maintenance across Canada's existing building portfolio. North American construction as a general practice favours buildings with a limited life span and a focus on single usage – which is a very wasteful practice. Developing and upgrading buildings for greater durability, adaptability and flexibility will provide greater advantages to investors.

[6] As one example, the developer of the Dockside Green development in Victoria, B.C. committed to pay the City of Victoria one dollar per buildable square foot as a penalty for all buildings that fail to achieve the LEED certification detailed in the MDA. Source: "Public Interest, Private Property: Law and Planning Policy in Canada" Anneke Smit, Marcia Valiante

Adoption of Sustainable Materials	The consideration of full life-cycle of products and materials that are being used in buildings will enable designers to inform material choices as opposed to being a compliance task at the end of the building certification process. While tools and methodologies for life-cycle assessments (LCAs) exist, the design community needs support to incorporate these early and quickly in the design stage.
Supporting Industry Training & Ongoing Education	Green building requires professional expertise and a better trained workforce as codes become increasingly complex, technology advances, and roles become more interdisciplinary because of the more systems-based focus. The increased need for education and training is running against demographic realities and skilled labour shortages. What is currently lacking is a multi-pronged approach to training that supports all of the different programs to help the construction industry understand, design, and build greener buildings. More investment in this space is required to support structured and modernized internship, mentorship, or apprenticeship programs, as well as recognized credentials for professions such as building operators. Investing in education and training, as well as the policy, regulatory, and incentive frameworks to support uptake of skills development and ongoing learning will be essential to success going forward.
Developing Supportive Policy & Incentives	Closing the gap between market leaders who have embraced green building and the bulk of the building industry will require a policy-driven carrot-and-stick approach to be most effective. The multi-unit residential segment is a particular area that requires greater attention across Canada. Legislation, changes to building codes, and a range of incentive and financing options are needed to construct and retrofit better buildings and homes. On the regulatory side, strengthening the building code is often the best tool available. Embedding performance targets into codes could help to drive improvements and level the current playing field. On the incentives side, a range of tools and program options exist – including tax breaks, grants, and rebates. The key is longevity in program design and delivery in order to achieve market transformation.

IN SUMMARY

Canada's green building industry has grown quickly and accomplished a great deal in a short period of time despite a range of barriers and challenges. However in order to accelerate market transition, a national, cross-sector strategy led by industry and supported by all levels of government is needed. This strategy will enable full realization of the benefits across the value chain and spectrum of opportunities for Canadian businesses, governments, and Canadian consumers and residents more broadly.

Appropriate support in the areas indicated above, including increased investment in research, development and deployment (RD&D), as well as education and training, could help to maximize the economic and employment opportunities that come with being a global leader while benefiting from the environmental, health, and societal contributions provided by the sector.