



Presents

The Carbon Impact Initiative

An Industry-Led Action Plan
in Support of Canada's
International Climate Change
Commitments



If climate change issues are not adequately addressed—if the price on carbon is not set, if policymakers don't have it on their radar screens—then financial stability in the medium and long-term is clearly at stake.

Christine Lagard,
International Monetary Fund



UNITED NATIONS ENVIRONMENT PROGRAMME

Programme des Nations Unies pour l'environnement Programa de las Naciones Unidas para el Medio Ambiente
Программа Организации Объединенных Наций по окружающей среде برنامج الأمم المتحدة للبيئة
联合国环境规划署



The global community has begun to recognize the need to make changes to our unsustainable consumption and production patterns. As a result, world leaders at the Rio+20 conference in Brazil adopted the “10 Year Framework of Programmes for Sustainable Consumption and Production” (SCP). When combined with the United Nations “17 Sustainable Development Goals” (SDG), these efforts demonstrate the positive impact that can be achieved across programs through international collaboration.

Cities are where most of consumption and production happen, and with growing urbanization, city-level actions should be reinforced, making cities primary players to deliver sustainable solutions in the production of goods and enable responsible consumer choices. Delivering SCP through city-level action starts with buildings, the low hanging fruit for energy efficiency and reduction of CO2 emissions.

Moreover, the COP21 Paris Agreement has highlighted that sustainable lifestyles and sustainable patterns of consumption and production, with developed countries taking the lead, play a crucial role in addressing climate change. This has been reinforced by the organization of a special Buildings Day, to be replicated at other UN Climate COPs, and the establishment of the Global Alliance for Buildings and Construction aiming at enhancing communication and collaboration, synergy and joint actions among initiatives active in the sector.

The New Urban Agenda, being prepared through Habitat III process, should provide an opportunity to focus on vertical and horizontal integration and the implementation of the SDGs at the city level, starting with SDG 11. Promoting resource efficiency at city level will increase economic resilience, contribute to climate mitigation, reduce waste and associated costs, while improving quality of life.

Since 2006, UNEP has focused on buildings, not only through needed policy frameworks, but also through a multi-stakeholders approach bringing together through the Sustainable Buildings and Climate Initiative. Initially focused on performance, assessment of policy instruments, baselines and developing tools, the attention has progressively expanded to material and water consumption, and waste generation, in addition to energy and carbon emissions.

UNEP is keen to promote environmental sustainability and contribute to delivering sustainable development through low-carbon, inclusive, green and resilient economies and societies. To that end, it is essential that countries such as Canada get engaged more pro-actively in an objective and responsible low carbon agenda, bringing government, central and local, together with business in a long term strategic alliance for delivering needed transformative change in policies and actions, in market evolution and lifestyles, towards responsible and SCP patterns for delivering sustainability.

I congratulate EllisDon and Partners on the work of the Carbon Impact Initiative.



Arab Hoballah, *Chief*

Sustainable Lifestyles, Cities and Industry Branch, “Delivering SCP”

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The impact on society from recent environmental disasters, such as Hurricanes Katrina and Sandy in the USA and the fires in Fort McMurray in Alberta, Canada are teaching us that we can no longer plan our cities based on historical practices. Exasperated by a changing climate, there are considerable financial, social, and environmental impacts that our two countries are having to deal with on an ever more frequent basis.

Across North America, we need to develop resilient cities and towns that are prepared to support the needs of future generations. Our buildings must become much more efficient; our energy must come from clean, renewable sources; and our transportation and communication systems must adapt to the rapid advancements in technology. The Federal Alliance for Safe Homes has been working with national and international partners since 1998 to to advance disaster safety and resilience. We now need to come together with other leading agencies on both sides of our border to turn plans into action.

Our public leaders are working to develop international consensus on climate change, but it will take a multi-disciplinary, collaborative, and coordinated approach to ensure the safety of our citizens. It will come down to Industry leaders to find solutions where environmental and social impacts are managed while ensuring economies have the resources required to prosper.

We have a daunting task ahead of us. It will take leadership programs like The Carbon Impact Initiative developed by EllisDon Corporation and their industry partners to find a way forward. We must support and leverage these types of initiatives whenever possible to develop real solutions that will establish a new generation of resilient, efficient and prosperous communities.



Leslie Chapman-Henderson,
President and CEO

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The world needs new ideas, smart solutions and sustained effort to meet the environmental challenges we face. By working together with our G7 partners, we can advance global action on climate change, including the implementation of the Paris Agreement, and the promotion of carbon pricing and low-carbon economies.

Catherine McKenna, Minister of Environment and Climate Change

Forward



On behalf of our program partners, we would like to thank everyone who has participated in the development of the Carbon Impact Initiative. We recognize that nations around the world are already leading a global shift in preparation for the new environmental realities we will be facing over the coming decades. This program represents the first step in our collective efforts to provide the industry leadership required to meet Canada's international commitments on climate change.

As economies restructure and climate change continues to impact our environment, we must do our part to ensure cities and communities are prepared to support the needs of future generations. It is our responsibility to ensure the buildings we are constructing are prepared to adapt. This means responding to atmospheric conditions, but it also refers to cities that will need to function in a world with ever-limiting natural resources and skyrocketing operating costs. We are fortunate in Canada that our easy access to abundant natural resources like fresh water will buffer us to some degree against climate change, but we must recognize our responsibility to the international community. If we can stand as leaders in low-carbon strategies, such as resilient building design, we can then leverage Canada's strong reputation in research and development to lead the transformation of the building construction sector in Canada and around the world.

World markets continue to struggle with economic stability. As such, we must carefully consider how to foster development in emerging markets, provide support to weakening markets and capitalize on growth industries. We also need to recognize that advancements in new technologies are changing our industry at a rapid pace. We need to be part of the change by investing in cleantech development, incubate new ideas and methodologies, and hire industry innovators. Innovation itself must dictate the way forward and shape our thinking—we must be prepared to do what has never been done before.

Geoff Smith,
President and CEO
EllisDon Corporation

Jody Becker,
Chief Strategy Officer and Senior VP Emerging Markets
EllisDon Corporation

The post-Paris world shows that the momentum for a low-carbon economy is undeniable.

Peter Bakker, World Business Council for Sustainable Development

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Introduction

Shifting Markets Toward a Low-Carbon Economy

By **Andrew Bowerbank**, *Global Director, Sustainable Building Services, EllisDon Corporation*

For decades, there was a perceived barrier in Canada between economic and environmental interests, with leaders on each side defending their cause with little consideration for the opportunities available if they worked together. Then at the beginning of this decade, there was a gradual shift in thinking, with leaders from all sectors realizing that natural resources are becoming increasingly limited and the impacts of population growth and consumption are taking a toll. Stories about shortages of food, water, fossil fuels, raw materials and more continue to emerge from around the world.

In response, the concept of “sustainability” has grown into a strategy on to which all sectors have signed. Campaigns to conserve energy, reduce air pollution, protect fresh water and more have become mainstream opportunities. The concept of a green building as a holistic design strategy began to get noticed, and rating systems from around the world—including LEED, BREEAM, Green Star, DGNB, CASBEE and others—have been gaining traction. Today, large corporations and small businesses look for opportunities to conserve energy and resources to maximize returns. But these past activities in the name of sustainability have not been enough to stimulate market transformation. Even with all the great work Green Building Councils have been doing around the world, only 10-15% of buildings today can be classified as “green.”

Only 10-15% of buildings today meet required sustainability standards.

The United Nations states the Earth’s population will reach 9.7 billion by 2050 with an estimated 34 “megacities”¹ (populations of more than 10 million) targeted to be in place around the world. Where will the resources come from to meet the demand of these urban centres? According to Dickson Despommier at Columbia University, to feed everyone, the world will need new agricultural land equal to the area of Brazil; this amount of fertile land does not currently exist on Earth.² Without technological solutions or regulatory intervention, demand for gasoline could double by 2050 and easy access to proven oil reserves could be over by the end of the century. Close to home, California’s water shortage is becoming a grave concern, and water desalination plants are being built around the world at great cost. Renewable energy (excluding large hydroelectric plants) only makes up 10% of the global energy market,³ and after a decade of relentless growth, coal still remains the dominant energy source; according to the International Energy Agency, coal has peaked but is still expected to provide a majority of the world’s power until 2020.⁴

The good news is that markets are now responding to global environmental issues and we must recognize we are in the midst of a tipping point in how we are driving our economies. The time to convince markets to change has long passed. Regions around the world are waking up to the impacts our current patterns of growth and consumption are causing, and they are creating innovative solutions to help drive markets toward a low-carbon economy.

Global markets are moving in the right direction. In 2015, for the first time, renewables accounted for the majority of new electricity-generating capacity added around the world, and China is now the largest investor in cleantech and renewable energy. Reports show reductions in carbon emissions can be achieved

at a more rapid pace and more cost effectively than originally believed.⁵ Canada has also made great strides in developing a green economy; in addition to provincial public programs introduced to stimulate cleantech developments, private-sector investments have risen dramatically since 2013. However, Canada’s efforts need to ramp up over the next few years to keep pace with other developed nations. German Chancellor Angela Merkel, for example, announced in 2015 that the G7 leading industrial nations have agreed to cut greenhouse gases by phasing out fossil fuels by the end of the century.⁶

The Carbon Challenge

Society continues to be challenged with a long list of issues “of the utmost importance,” but climate change has united us under a common objective. Collectively, nations have been trying to put a cap on carbon emissions since the United Nations Framework Convention on Climate Change hosted the first annual Conference of the Parties (COP) in 1995 in Berlin. Every subsequent year, leaders left without making strong commitments or coming to a unilateral consensus—until November 2015 at the COP21 Paris Agreement. For the first time in more than 20 years of negotiations, an agreement was reached by 196 countries (including China and the United States) to keep global temperature increases “well below” 2°C by the end of the century. World leaders hailed the commitments as historic.

Going low-carbon is the only option for a profitable, future-proof business.

Environment Agency (UK)



We have entered a new era of global cooperation on one of the most complex issues ever to confront humanity. For the first time, every country in the world has pledged to curb emissions, strengthen resilience and join in common cause to take common climate action. This is a resounding success for multilateralism.

UN Secretary General Ban Ki-moon stated at the end of COP21

Introduction

The private sector was also more visible and active at COP21 Paris than at any previous Conference. CEOs from industries as far ranging as manufacturing, transportation, energy and high-tech stepped up their efforts to address climate change. Together, they committed to decrease their carbon footprints, adopt renewable energy and engage in sustainable resource management. For the first time at a COP, opportunities in buildings and infrastructure were presented through a dedicated COP Buildings Day. Global financial institutions also pledged to make hundreds of billions of dollars in investments available over the next 15 years for clean energy and energy efficiency.

The Emerging Carbon Market

Political promises alone will not be enough to drive market transformation. Public and private-sector collaboration will be needed to meet COP21 Paris commitments. The private sector will play a critical role in building a low-carbon future, but it needs strong policy signals from governments around the world, removal of existing regulatory barriers and the creation of a stable business environment in which private-sector climate investments will thrive. The private sector has already been demonstrating great leadership by infusing the largest source of climate finances into the market to date. In 2014 alone, US\$243 billion were committed to climate-



related investments—and this is just the start. The sea-change in the global investment community really began in 2015 according to Bank of England Governor Mark Carney. The signs have all been there, not the least of which is the recognition by the G20 group of major economies that climate change represents a threat to the stability of the global financial system. The unmistakable message is that the world is changing, the major economies are beginning the transition to low-carbon energy systems. The issue is not whether they care about climate change, but whether they are properly managing risk in a changing world.⁷

The Role of Canada's Public Sector

Canada's new government took office in November 2015 and immediately prepared to make bold commitments on climate change. Federal Environment and Climate Change Minister Catherine McKenna surprised world leaders at COP21 Paris when she announced that she wanted the Paris Agreement to restrict planetary warming to just 1.5°C—not just the 2°C under negotiation at the Conference. It is the role of governments to provide direction, and Canada is stepping up in a big way. But we as industry leaders need to understand the magnitude of this commitment and what will be expected of us. It will require Canada to reduce emissions by 30% below 2005 levels as a starting point, and some analysts state it would require much larger reductions to even come close to meeting COP21 Paris commitments.⁸

If Canada starts with a 30% reduction commitment, it is not out of step with other nations. European leaders agreed in October 2015 to reduce emissions by at least 40% compared to 1990 levels, and the United States has set a target of 26% to 28% below 2005 levels by 2025. What does a minimum 30% emissions reduction plan look like for Canada? Market leaders have made comparative predictions, including phasing out coal and converting to 100% renewable energy over the next 35 years; Net Zero Emission commercial buildings and homes; the electrification of personal and public transportation; and the use of more electricity in industrial processes.⁹

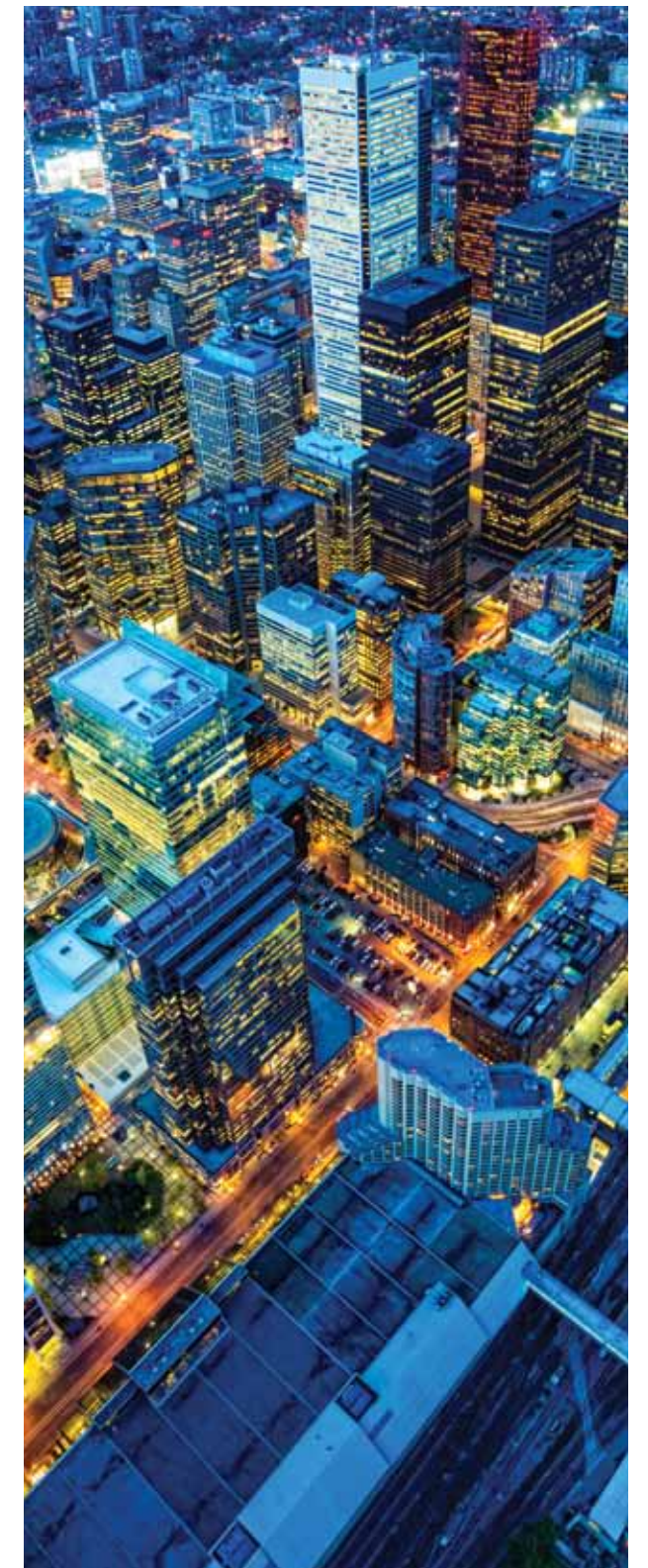
An Industry-Led Response Strategy

Industry leaders in Canada need to understand there is a short time frame, starting now, to get in front of opportunities, or they risk falling behind the pace of change. If federal and provincial governments are committing Canada to participate in international emission reduction targets, industry will bear the brunt of the responsibility to meet them. The public sector needs to set policies to guide development and put a price on carbon. Then we will have the tools we need to move forward.

At EllisDon, we understand the commitments expected of industry leaders over the coming years, but we also recognize the opportunities in the shift toward a low-carbon economy. We know a transformation of markets cannot be done alone. It will take the combined efforts of large corporations working together. We have taken the bold step to engage like-minded companies from across the building construction sector to partner with us on our journey to develop our Carbon Impact Initiative. Our founding partners are some of the largest and most influential in the sector, including BASF Canada, Enbridge Gas, Cricket Energy, WSP Group, the Cement Association of Canada and Cisco Systems, and we expect to engage more over the coming years.

Our Carbon Impact Initiative partners have already made great strides in leading energy and resource conservation programs in their respective fields, and now is the time to come together to deliver more aggressive results. The Carbon Impact Initiative is about a systems approach to establishing a low-carbon built environment in Canada. It is about bringing proven industry expertise to designing and constructing hyper-efficient buildings and green infrastructure, integrating innovative smart/clean energy technologies, adopting low-carbon materials, conserving resources, and exploring ways to retrofit and adapt existing building stock to meet new performance targets.

At the end of the day, the Carbon Impact Initiative is about delivering the large-scale initiatives required to meet Canada's commitments to international emission targets, and it is about celebrating successes in the marketplace for the benefit of future generations. ■



We are now going through a sustainability revolution that will rival the agricultural and industrial revolutions in the way it will transform society [...] Innovation and creativity will be needed to develop radical, new products and processes that are less damaging to the environment and generate new businesses and jobs.

Department of Trade & Industry, London, England



Background



The Evolution of the Built Environment

Successfully transforming our markets into a low-carbon economy will depend on how well we adopt a new way of conducting business based on systems design and planning. There is no single solution: all market sectors have an important role to play, but that also means each has an opportunity to benefit from the resulting economic opportunities. In this action plan, we are focused on the leadership opportunities. As industry leaders, it is our collective responsibility to lay the foundation for future markets and companies to thrive. The foundation in this case is the built environment that surrounds us. It is the skeleton the rest of the economy needs for structure and security.

Buildings have played a major role in human development. We sleep in buildings, we work in buildings, and our children are educated in buildings. They have an intimate, emotional connection to the community

and, therefore, have a unique role to play in driving a low-carbon economy. We can use this relationship to share a unified message and demonstrate how low-carbon, ultra-efficient buildings are better in quality and performance than what comes standard today. According to the United Nations, buildings are responsible for 40% of the carbon emissions into our atmosphere as a result of the construction, operations and maintenance required over the life of a building. Urban society spends 90% of its time in buildings, and as climate change begins to have increasingly dramatic impacts on weather patterns, we will need to rely even more on buildings to shelter us.

As we develop programs for low-carbon solutions in this action plan, buildings give us an opportunity to bring a powerful story to the market and promote successes. If people spend 90% of their time inside

buildings, everyone will be able to experience the improvements made to the buildings they occupy and understand the efficiencies and technologies adopted. Everyone should feel as though they are part of the shift toward a low-carbon economy. Because they are.

The Relationship between Buildings and Infrastructure

Although the market divides buildings and infrastructure into two separate sectors, they have a close relationship that can make it difficult to coordinate development independently. Where buildings shelter us and define our surroundings, infrastructure is the connector needed to pull all assets into a unified system that makes up the built environment.

At EllisDon, we have grown into a full construction services company that places equal emphasis on designing, building, financing and maintaining large-scale commercial buildings, urban infrastructure and energy projects. All services are unified through one company. The partners we work with under the Carbon Impact Initiative also work across the building and infrastructure sectors. Together, we are looking for opportunities beyond just buildings—we are looking to reduce carbon emissions across the entire built environment.

According to the World Bank, rapid urbanization will change the economies and lifestyles of people living in developing countries over the coming decade. It is expected that 70% of the world's population will live in urban areas by 2050, with the biggest growth in emerging markets. Since buildings are expected to count for 30% of global emissions by 2030, it is critical to make the right investment choices today to push the market towards resource efficiency. In this way, we can avoid locking in high-carbon urban infrastructure and reward those who choose to develop, live and work in green buildings.¹⁰ ■

Cement Association of Canada

The Cement and Concrete Industry: Working Towards a Low Carbon, Sustainable Future

Concrete has been at the heart of building our civilization since before the Romans built the Pantheon. Today, concrete is the second most used material in the world, after water. It is literally the foundation of modern society. As communities across Canada and around the world address the urgent challenge of moving toward a low carbon, climate resilient future, the cement and concrete industry will continue to play an essential role.

Canada's cement and concrete manufacturers are innovating and adapting their products and processes to contribute to a sustainable future, focusing on four main areas:

1. Reducing carbon through the use of low carbon fuels, low carbon cement, carbon sequestering concretes and advanced carbon capture technologies.
2. Innovating concrete solutions to improve the energy performance and lifecycle carbon footprint of buildings, pavements and infrastructure.
3. Participating as an active partner in progressive public policy decisions, including working to support carbon pricing and related policies across Canada.
4. Staying true to their heritage as a local industry by remaining steadfast advocates and supporters of the communities in which they operate.

The cement and concrete industry is proud of the leadership and vital contribution to Canada's economy through the support of 170,000 jobs and \$82 billion in associated revenues. Durable, resilient, energy efficient and infinitely versatile, concrete is the most cost effective solution for safe, low carbon, sustainable communities.

STRATEGY



Government Actions and Business Case for Carbon Reduction

International Leadership

The United Nations Environment Programme and other international agencies have been on the frontlines since the early 1990s to bring climate change science to policymakers and establish global partnership initiatives. As a result of these efforts, there is now strong international leadership around the low-carbon economy, and the success of the COP21 Paris Agreement sent a strong signal for ambitious and sustained global climate action. With a global framework in place and the agreement signed, the focus has shifted toward implementing the pledges. Around the world, about 40 countries and more than 20 cities and regions—representing almost a quarter of global greenhouse gas emissions—are putting a price on carbon.¹¹

Looking by sectors, energy production and use account for two thirds of the world's greenhouse-gas emissions,¹² and after COP21 Paris, the International Energy Agency has called for national, regional and local action and the mobilization of public and private finance for low-carbon energy supply and infrastructure. On the banking side, a consortium of eight U.S. and European financial institutions and investors have formed the Bank of America's Catalytic Finance Initiative to direct \$8 billion in total commitments toward high-impact sustainable investments.¹³

Most importantly, companies recognized for leading in carbon reduction have the most to gain. A 2014 report by U.K.-based non-profit CDP linked leadership on climate change to profitability. Corporations actively preparing for climate change secure an 18% higher

Cricket Energy Group of Companies is a vertically integrated energy services company specializing in residential new construction. Created to meet the needs of the design and development community, Cricket Energy provides energy simulation, IDP design optimization, metering and monitoring, renewable energy integration and green energy systems financing services.

Cricket Energy company Provident Energy Management Inc. has certified the largest number of LEED multi-unit residential projects in Canada and supports the development community with incentive application through Toronto Tier 2, HPNC and Enbridge Savings by Design Programs.

A common refrain when discussing high performance buildings is that occupant interaction interferes with design efficiency, which has been demonstrated on many occasions. Provident Energy Management addresses this issue with real-time Systems Monitoring and Alarming services and continuous re-commissioning.

With the cost of sub metering and monitoring devices plummeting and wifi and bluetooth enabled devices proliferating, it is technically possible and economically feasible to meter and monitor all of the energy plant and auxiliary devices to provide real-time, remote insight into the operations and efficiency of the buildings systems. Using software apps to set performance parameters, these monitoring systems alarm a remote call centre that responds immediately to any variance outside of those set points.

STRATEGY

return on investment than companies that did not—and this is 67% higher than companies who refuse to disclose emissions levels.¹⁴ In February 2016, the Canadian Chamber of Commerce identified climate change as one of the top 10 barriers to Canada's competitiveness, citing that a lack of a national plan for greenhouse-gas regulation is discouraging investment in the economy and harming industry's ability to create jobs. With so much action happening around the globe, Canada must keep pace—and now is an opportunity for real change.

National Leadership

At COP21 Paris, Canada agreed to take steps to support the transition to a global low-carbon economy through a collaborative approach across Canadian governments. To build on this momentum, at the First Ministers' Meeting on March 3, 2016, federal, provincial and territorial governments agreed to work together to create the Vancouver Declaration on Clean Growth and Climate Change. The declaration will focus on five commitments:

- 1 Increase the Ambition:** Implement greenhouse-gas mitigation policies to meet or exceed Canada's 2030 target of a 30% reduction below 2005 levels.
- 2 Promote Clean Economic Growth:** Provide certainty to business and encourage investment in clean technology solutions.
- 3 Deliver Mitigation Actions:** Transition to a low-carbon economy by adopting measures including carbon pricing, cleantech investments, and enhancing carbon sinks.
- 4 Increase Action on Adaptation:** Support climate resilient development and green infrastructure, and collaborate with Indigenous peoples to support local adaptation efforts.
- 5 Enhance Cooperation:** Facilitate cooperation to strengthen public communication and participation on climate change.

Public Sector Drivers

In order to achieve these commitments, the ministers agreed to work together to develop a pan-Canadian framework on clean growth and climate change to be implemented by early 2017.¹⁵ The federal government also used the March 2016 budget announcement as an opportunity to make several commitments to carbon reduction and clean-growth initiatives totalling \$8.5 billion.



“Canada stands at the threshold of building our clean growth economy. This transition will create a strong and diverse economy, create new jobs and improve our quality of life. [...] Together, we will leverage technology and innovation to seize the opportunity for Canada to contribute global solutions and become a leader in the global clean growth economy.”¹⁶

**Vancouver Declaration on
Clean Growth and Climate Change**

Regional Leadership

In North America, climate change continues to grow as a political priority. As of early 2016, there were 17 emissions trading systems in place around the world. When it comes to solving Canada’s carbon challenges, provincial governments are looking to carbon pricing—either as a direct tax, as a cap on greenhouse-gas emissions, or through regulations—to encourage the development of low carbon solutions and invest in clean technologies.

The federal government said pricing carbon emissions “will drive Canada’s transition to a stronger, more resilient, low-carbon economy”¹⁷ and has let provinces take the lead—which allows them to keep revenues within provincial borders. This will take significant investments to accomplish. The carbon market of the Western Climate Initiative currently includes California and Quebec. Manitoba and Ontario are preparing to join, while the other provinces are currently developing their plans for carbon-reduction strategies, taxes or trading schemes.

Municipal Leadership

The impacts of severe weather are most strongly felt at the municipal level—flooded streets, overloaded watermains, and utility outages put tremendous strain on local assets and resources. As well, in Canada, local governments have direct or indirect responsibility for up to half of all greenhouse gas emissions.¹⁸ To help municipalities reach their low-carbon and resilience objectives, in March 2016, the federal government put \$75-million toward local climate change mitigation and adaptation programming. To be administered through the Federation of Canadian Municipalities, these initiatives will provide a suite of grants to support studies, plans and pilot projects that enable better planning, analysis and decision-making related to capital investments.

“Cities around the world must show continued leadership to meet the urgent challenge of climate change, and the most impactful change we can make is a shift toward 100% of our energy being derived from renewable sources. The future of Vancouver’s economy and livability will depend on our ability to confront and adapt to climate change.”¹⁹

Vancouver Mayor Gregor Robertson

City leaders are also taking action in carbon reduction strategies. In June 2015, ahead of the COP21 Paris Agreement, mayors representing 21 of Canada’s big cities called for binding targets to reduce greenhouse gas emissions; this “Canada’s Big City Mayors’ Caucus” also called on members to develop and implement climate action plans that both identify the risks and detail how they will be mitigated. The resolution also commits cities to regular reporting of emissions through the U.K.-based Carbon Disclosure Project. Global initiatives are already helping cities lead in this way, including the Carbon Neutral Cities Alliance and the Compact of Mayors; the European Covenant of Mayors has brought together 6,300 municipalities under an agreement to strive for greenhouse-gas reductions of at least 40% by 2030.

Action at the local level is critical to success, and Vancouver is seen as a leader, having established their mission to become the greenest city in the world by 2020 and be powered entirely by renewable energy before 2050. Its Greenest City 2020 Action Plan outlines 10 goal areas and 15 measurable targets—and has already completed more than 80% of the high-priority items in the plan. Vancouver has joined 16 other cities in the Carbon Neutral Cities Alliance to cut greenhouse gases by at least 80% by 2050.²⁰

Waterfront Toronto is also focused on low-carbon initiatives, including contaminated soil management, mandating sustainable energy practices, green building standards, and increased waste diversion. The Lower Don Lands is one of the founding projects of the C40 Climate Positive Development Program, composed of 18 projects across six continents including the 15-acre Dockside Green waterfront community in Victoria, British Columbia. The program supports projects striving to reduce their emissions below zero, reducing emissions on site and in neighbouring communities. ■

Waterfront Toronto

As the master developer of the waterfront, Waterfront Toronto is mandated by the federal, provincial and municipal governments to deliver sustainable, mixed-use communities. At 800 hectares, this is one of the largest waterfront revitalization projects in the world.

Sustainability and resiliency are integrated into all aspects of the corporation’s planning, design and project delivery. Waterfront Toronto aims to be a test bed for new approaches that foster economic innovation, build inclusive neighbourhoods, and develop the low carbon communities of the 21st century that support COP21 commitments on climate change mitigation.

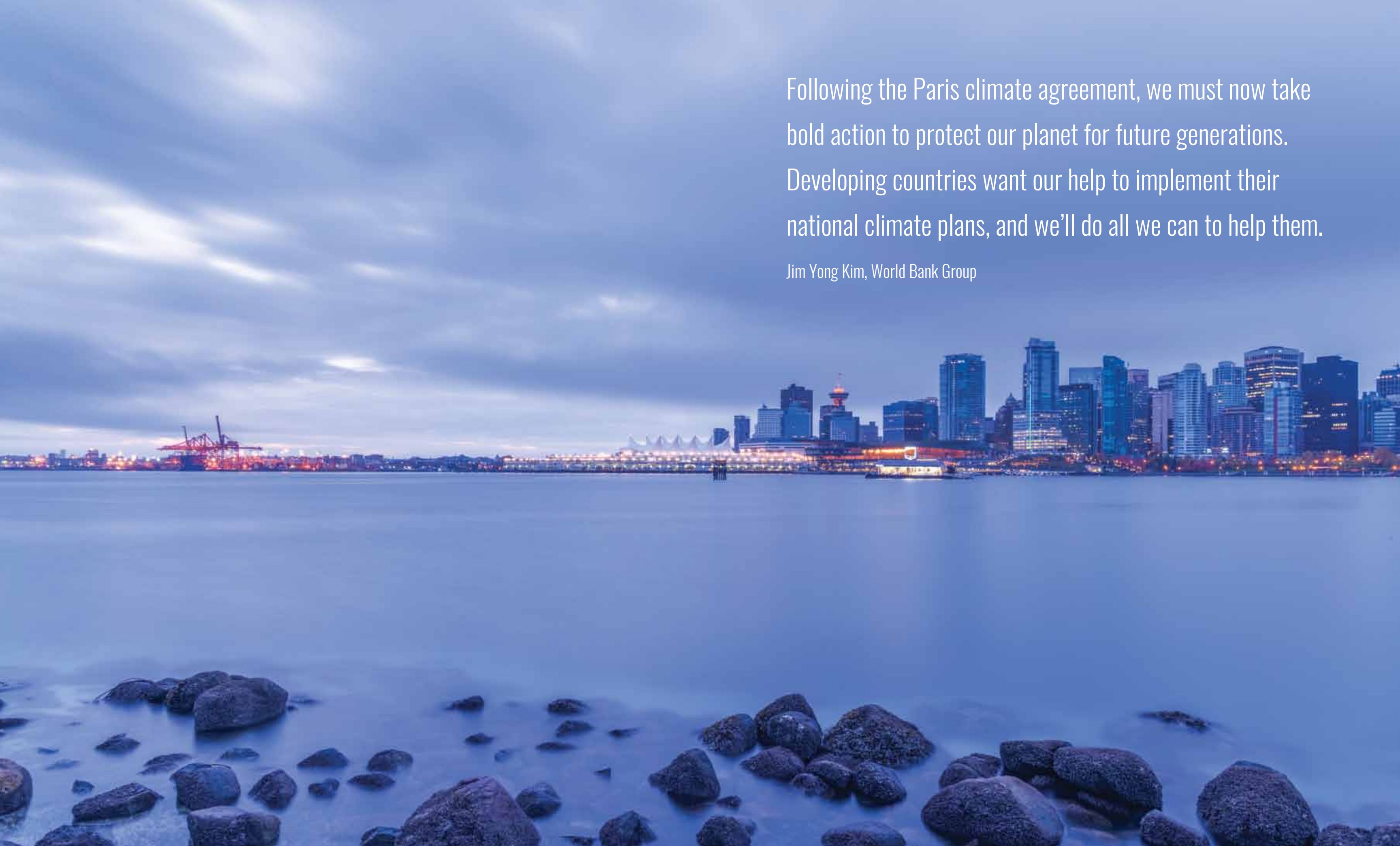
Waterfront Toronto’s Minimum Green Building Requirements (MGBR), first introduced in 2005, transformed the market by demanding higher-performing buildings on the waterfront and led to greater uptake of LEED Gold buildings in Toronto. Our MGBR includes LEED Gold, in addition to high levels of energy and water efficiency, renewable energy generation, Electric Vehicle infrastructure, flexible building design, and green roofs, among others. To date, we have four LEED Gold-certified buildings with 13 more under review, construction, or design. We have also achieved significant energy reductions in our buildings, with an average of 44 per cent reduction in energy cost. Sustainability is also built into our parks and public spaces through such features as renewable energy generation, biodiversity and habitat creation and closed loop stormwater and irrigation systems.

Waterfront Toronto’s Lower Don Lands precinct has been designated by the C40 Climate Positive Development Program as one of the 18 visionary projects that strive to reduce on-site carbon emissions to below zero. A variety of strategies, including innovative energy systems and new economic/partnership models, will be employed to achieve this target.

STRATEGY

Following the Paris climate agreement, we must now take bold action to protect our planet for future generations. Developing countries want our help to implement their national climate plans, and we'll do all we can to help them.

Jim Yong Kim, World Bank Group



Intent of the Carbon Impact Initiative

Can the Marketplace Drive Change through a United Front?

The market has made progress in energy efficiencies, conserving resources and championing environmental programs, but to date, each of these have been done through individual efforts. Only when groups, projects and people unite do we begin to see meaningful long-term impact and market shift.

The LEED rating system for buildings is a good example of how, collectively, we can become much greater than the sum of our parts. What began as a third-party evaluation program led by the U.S. Green Building Council has turned into a movement in the marketplace with international reach. But it took years of work and countless hours from committed professionals to take LEED to where it is today—a program able to achieve meaningful results in 12% of the construction market. We are going to have to do far more than affect change in a small portion of the market, but we can look to the accomplishments of LEED as a means to stimulate greater efforts.

The difference in today's market compared to the year 2000, when LEED was first established, is that there is now an aligned perception among nations that there is a real global problem supported by scientific consensus. Climate change has been a game changer, so the response strategy must also change to meet the



challenge. Whereas LEED was originally intended to provide progressive building owners with a showpiece of energy and environmental design, the next step must go beyond individual project leaders to encourage a global market transformation.

A transformation of the global marketplace can only be achieved when large, influential corporations make it their collective mission to drive change through a unified, collaborative front. And we must do so within a generation. To understand the potential scale of effort required, we must look toward other rapid market transformations. We have seen communication and entertainment industries transform from analog to digital; and we have seen advances in medicine transform the global health-care system through organ transplants, disease eradication, DNA sequencing and more. For any greater examples of society's ability to change, we unfortunately need to look at how nations have pulled together in response to military conflict.

We must figure out how large market segments can shift together, and the first step is to identify the markets that can have the greatest impact. Since the United Nations has identified that buildings account for 40% of the emissions, our Carbon Impact Initiative has its starting point.

Leading the Way in Canada with the Carbon Impact Initiative

The first step toward the launch of this Action Plan began when EllisDon reached out to some of Canada's most influential companies across the building construction sector to work with us as founding partners. The idea was to identify leading contributors in the development of large-scale commercial buildings, energy, communications and infrastructure across Canada who were also making great strides in sustainable development and advanced energy technologies. The next step will be to expand our market reach by inviting others to participate in initiatives that demonstrate to

the market how industry can work with government to lead the shift toward a low-carbon economy in Canada. Founding partners include:

BASF Canada is the national representative for the world's leading chemical company. BASF, through science and innovation, enables customers in nearly every industry to meet their product development objectives by combining economic success with environmental protection and social responsibility.

WSP Canada is one of the world's leading professional services groups, ranked in the top five globally for building engineering and design. The firm is highly regarded for their successes in thoughtful and innovative solutions across the full range of natural and built environment projects.

The Cement Association of Canada is the voice of Canada's cement industry. Corporate members work together to maintain a sustainable industry as well as promote and advance the economic, environmental and societal benefits of building with cement and concrete.

Cricket Energy is a leading provider of heating, ventilation, air conditioning, water and renewable energy systems for new and existing multi-unit residential buildings. For over 30 years, Cricket has been building a reputation for offering the most effective and energy efficient products available in the market.

Enbridge Gas Distribution traces its roots back more than 160 years and today delivers safe, reliable and affordable natural gas to over two million residential and commercial customers. Their "Savings by Design" program has set an industry standard for incentivising the design of energy efficient commercial and residential buildings in Ontario.

Cisco Systems was founded in 1984 and has grown into the biggest networking company in the world. Cisco designs, manufactures, and sells internet protocol based networking products and services related to the communications and information technology industry. ■



A sustainable financial system must also integrate climate security as part of the performance framework.

Achim Steiner, United Nations Environmental Program



The Carbon Impact Initiative: Industry Leaders Workshop

On February 4, 2016, seventy senior industry executives from across sectors came together for an intense day of discussions around what it will really take for Canada to meet international emission reduction targets. Each participant at the Industry Leaders Workshop was specifically chosen for their leadership, experience and accomplishments across a variety of industries, including design and engineering, materials, manufacturing, energy management, communications technology, project financing, product commercialization, and more. This report will highlight the innovative ideas that emerged from the workshop.

At the workshop, presentations were made by public-sector leaders from Natural Resources Canada, the Province of Ontario, Waterfront Toronto and others to set the stage for the subsequent table discussions and program planning. There was also a presentation on international market developments by the World Business Council for Sustainable Development and a panel discussion with prominent sector leaders. The topics covered gave participants a snapshot into the challenges government leaders at all levels face over the coming years.

Getting Down to Work

Eight tables were set up, each focused on a different topic, and participants were assigned to seats based on their background and experiences. The table topics were designed to engage the participants and make them put real thought into what will be needed to transform the market toward a low-carbon economy. We wanted to hear about the lessons learned over the careers of these industry leaders, and more importantly, we wanted to understand their perspectives on the opportunities and the barriers before us as we work to create an industry led response strategy to Canada's international commitments on climate change.

Workshop Topics

TABLE 1 Public-Private Sector Relations:
Reducing Carbon through Buildings
and Infrastructure

TABLE 2 Reducing Emissions
from Existing Buildings:
The Barriers and the Opportunities

TABLE 3 Net-Zero Energy Buildings:
Design, Build and Retrofit

TABLE 4 Energy Sector Impact:
Striving for Next-Gen Performance Targets

TABLE 5 Low-Carbon Building:
Life-Cycle Carbon Accounting

TABLE 6 Innovation:
Integrating Emerging Cleantech and
Advanced Materials into Buildings

TABLE 7 Cross-Sector Collaboration:
Marketing, Communications
and Network Engagement

TABLE 8 Return on Investment:
Incentive Opportunities to
Encourage Market Uptake

TABLE 1 Public-Private Sector Relations:
Reducing Carbon through Buildings and Infrastructure

Government leaders committed at the COP21 Paris Agreement to keep global temperatures below 2°C. Achieving this target will require collective effort from public and private-sector leaders. Our experts explore what tools and resources will be needed to achieve success and develop strategies that can guide development in a low-carbon economy.

Prompting the Discussion:

- 1 Identify leadership roles needed to shift Canada toward a low-carbon economy. Where can government leaders be most effective?
- 2 What tools do industry leaders need to succeed in the emerging carbon market? What concerns or barriers could impede development?
- 3 Young professionals will need specific skills, so how can academic leaders best serve the carbon market in Canada?
- 4 Non-government and not-for-profit organizations have long provided advocacy roles to support strategic development across markets. How can NGO's be most effective in the emerging carbon market?
- 5 How can market leaders best respond to factors negatively impacting the global economy?

Industry Observations:

Unify the Industry's Voice: Within their respective industries, leaders can explore how innovation is changing their business and search for ways to apply the results to other sectors. Results can be used to foster new ideas and commercialize new cleantech. Together, developers can present ideas to government and give confidence that industry can adapt and respond to a stricter regulatory environment.

Public-Sector Directed Expert Advocacy: Bring in the vast expertise we have within the industry and academia to help government view climate change from a variety of perspectives that can foster new opportunities. Incorporate the knowledge and ideas from the experts in the respective fields to help show the public that industry supports carbon reduction efforts.

Raise Building Standards: Regulatory standards/ building codes aren't driving improvements as they stand now because buildings operated properly are generally performing better than the code states; therefore, we should advocate for higher standards to push the limits. Change the mindset that minimum code standards are the target and anything more is an added bonus.

Progressive and Innovative Financing: We need to promote financing that can incent businesses to incorporate sustainable, low-carbon initiatives and life-cycle assessments as a unified objective. The intent is to foster a desire among the architects, engineers, builders and operators to strive for the most sustainable targets possible.



TABLE 2 Reducing Emissions from Existing Buildings:
The Barriers and the Opportunities

According to the United Nations, 40% of carbon emissions comes from buildings. New building design will play a leading role in changing our future infrastructure, but we need to do more to improve the energy efficiency and structural resiliency of existing buildings. Current conservation programs in the market are designed to reduce energy use from existing buildings, but the impact of these programs are nowhere near what is needed to lower carbon-emission commitments set in place at COP21 Paris. A new approach is imperative.

Prompting the Discussion:

- 1 How effective can energy efficiency programs and retrofit initiatives be at reducing emissions to the levels required?
- 2 Does a new strategy need to be established specifically around reducing carbon in existing buildings? What are the barriers to current conservation strategies?
- 3 How effective can new technology be in providing effective carbon reductions in existing buildings versus initiatives that change behavior of owners/occupants?
- 4 How can building design facilitate end-user behavior to ensure the building will be used as intended during occupancy to maximize efficiency?
- 5 Are there ways to better align the interests of builder, owners, landlords and tenants so that all have a stake in energy efficient, sustainable buildings?

Industry Observations:

Know your Score: Households, businesses and governments must be held accountable for their buildings' performance with a centralized, publicly accessible database. Energy labelling will also create a competitive approach that gives an incentive to "be better" and reveals how one compares to their neighbours. This is working in Europe and can also work in North America.

Education – Changing the Approach: Existing buildings are going to have the biggest impact on reducing greenhouse-gas emissions, but it will be a long road before we begin to see meaningful results as it requires remobilizing and educating society. In order for occupants to be engaged enough to properly operate and maintain a building, integrated programs and training needs to be developed to ensure buildings are performing properly.

Effective Use of Analytics: Comprehensive data presented in the right format will give consumers the tools they need to make informed decisions. We then need to ensure they have the resources required to interpret the information, and we need to provide the incentives necessary to foster behaviour change.

Conserving energy in existing structures before planning to build new needs to be a primary objective. Finding the required incentives is the challenge.

TABLE 3 Net-Zero Energy Buildings: Design, Build and Retrofit

According to Pike Research, Net Zero Energy buildings could grow to a \$1.3-trillion industry by 2035.²¹ Net Zero Energy begins with energy conservation and finishes with generating required energy on site and/or purchasing additional energy from local renewable energy sources. Cities around the world are targeting Net Zero Energy for new construction, Canada needs to catch-up to this progress.

Prompting the Discussion:

- 1 In the Net Zero Energy design-build process, what added considerations are needed to manage the development process and client expectations?
- 2 What are some of the realities about Net Zero Energy targets for commercial buildings that clients need to be aware of?
- 3 What are some of the technologies, materials and systems projects should adopt?
- 4 What type of incentives are needed in Canada to support Net Zero Energy? Will up-front costs be a barrier (as it can be for green buildings)? Are net-zero buildings a realistic target for Canada?
- 5 What role should energy utilities play in Net Zero Energy developments?

Industry Observations:

Creative Financing:

- Life-cycle (specifically energy) cost savings needs to be integrated into financing and asset-valuation models to encourage clients to strive for net zero.

- Current financial models are driven by initial appraisals; we need new models that recognize sustainability as a part of asset value.
- There are many examples in the market where the life-cycle operations of a green building are not achieving the energy savings targeted during the design process. A full life-cycle analysis of Net Zero Energy will need to be conducted to ensure these systems can reach full potential.
- Net Zero Energy has the potential to provide benefits to multiple project stakeholders. The benefits need to be shared across all parties involved, as do the costs and risks associated with putting a project in the ground.

On-Site Energy Generation: In some cases, the cost for energy conservation strategies might be greater than the cost to install renewables and other alternative sources of energy. Until energy storage becomes viable and effective, off-site generation might be our only recourse. Interpretations of Net Zero Energy in Canada must allow for multiple offset strategies to achieve targets.

Pilot Projects: Net Zero Energy pilot projects will be necessary in order to communicate lessons learned. The use of public-sector buildings and educational institutions are a good place to begin a series of test projects to encourage market adoption.



TABLE 4 Energy Sector Impact: Striving for Next-Gen Performance Targets

In response to greenhouse-gas reduction targets, energy utilities will play a key role in Canada. They will need to set new levels of performance targets and provide direction to city planners and the building construction sector.

Prompting the Discussion:

- 1 With the current condition of energy initiatives, such as Ontario's Feed-in-Tariff for renewables and conservation and demand-side management programs, what are some of the new opportunities to be considered by utilities across Canada to advance high-performance building design?
- 2 Utilities across North America are working to adopt new smart grid technologies and prepare for new microgrid and distributed-energy systems. How do commercial buildings fit into this new structure? How do developers and energy utilities better collaborate?
- 3 Government and utility leaders around the world are beginning to drive development toward net-zero targets. What role should energy utilities in Canada play in net-zero developments?
- 4 In addition to performance targets, what other solutions are there to minimize greenhouse-gas emissions from the commercial building sector as a whole?



Industry Observations:

Introduce Next-Generation Incentive Programs: Public-sector leaders need to provide the resources required to launch new demand-side management programs across multiple building types to ensure peak operating performance. These programs need to build on historical successes by utility leaders, but must also have the tools and resources required to go far beyond accomplishments to date.

Advancing New Cleantech: Establish a mechanism whereby new technologies can be tested and verified to ensure quality and performance, and then develop effective channel-to-market strategies for commercialization and adoption by the market. Industry leaders understand that Net Zero Energy buildings can be achieved with current technologies, but we need to make sure the manufacturers of the technologies are bankable and will stand by their reputation to ensure quality control over the life cycle of a building.

Defining Net Zero Energy: Net Zero Energy is a new concept in Canada. We need to make sure the market understands the terms and definitions of Net Zero Energy and what is really expected of a client and a project to achieve that level of efficiency.

TABLE 5 Low-Carbon Building: Life-Cycle Carbon Accounting

Market studies demonstrate that buildings and infrastructure account for a higher proportion of greenhouse-gas emissions than other economic sectors, and emissions from building construction and operation have increased in recent decades. These emissions can be traced back primarily to heating, cooling and lighting systems, although emissions from embodied materials and construction processes are also significant. Exploring methods to account for and track embodied carbon over a building’s lifecycle will help bring down current levels to meet these targets.



Prompting the Discussion:

- 1 Now that Quebec and Ontario are committing to a cap-and-trade program in line with California and the federal government has committed to meet international emission limits, what are the opportunities for low-carbon building practices in the emerging carbon market?
- 2 What tools are available to help track greenhouse-gas emissions from buildings? What has been the success of these tools to date?
- 3 A number of European countries have a building labelling system in place that identifies a building’s energy rating, CO2 emissions, indoor air quality, et cetera. This information is collected and compiled through a national register and must be provided at point of sale for purchaser review. How would a labelling system like this work in Canada?
- 4 Tracking the embodied energy and emissions during the construction process is not yet a common practice. What are the perceived challenges to tracking emissions, and what factors need to be considered in the development of a carbon accounting process?

Industry Observations:

Standardized Reporting System: Tracking carbon in the built environment is a new process and almost unaccounted for in the North American building and construction sector. We need to work with certification agencies in Canada to establish a standardized benchmark for reporting emissions from design and construction to long-term operations and maintenance.

Defining the Scope: The construction sector needs to understand what is required to track and report on emissions. It will then be possible to determine what kind of tool is needed. We also need to understand the potential impact to the sector and prepare to streamline the process for developers. To establish full life-cycle carbon accounting, outcomes need to include:

- 1 Clear boundary conditions, what is to be included and what is not.
- 2 Proper balance between standardized benchmarks and local emission factors to ensure accuracy.
- 3 Effective communication of results at key points of the design and build process.
- 4 Established standards and protocols in GHG accounting
- 5 Recognition that the supply chain needs to provide a proper level of transparency.

TABLE 6 Innovation: Integrating Emerging Cleantech and Advanced Materials into Buildings

The commercialization process in today's market is providing us with unprecedented access to new technologies, and private equity/venture capital investors are rapidly turning tech companies into viable long-term businesses. As a result, we are witnessing a transformation of technology across all sectors and markets are struggling to keep up. There is also significant pressure for the construction sector to adapt and evolve in the face of high energy prices, environmental concerns and increased competition. Buildings need to become smarter, resilient and more energy efficient to meet our targets.

Prompting the Discussion:

- 1 What does innovation mean in the construction sector?
- 2 How can the latest developments in cleantech better penetrate the building and infrastructure market? What are the current barriers to adoption?
- 3 Renewable energy and energy storage technologies are surging internationally but Canada is struggling to keep pace with developments. Is this a fair statement? What are the options for Canada?
- 4 Consider opportunities to drive the adoption of new technologies and building systems at the scale needed to reduce CO2 emissions. Recommend strategies to help transform the construction sector for long-term success.
- 5 As populations grow and migrate to city centres, the resources required to keep up with demand will be taxed like never before. How will innovations contribute to solutions?

Industry Observations:

Industry Alliance: We need to identify the industry leaders that can properly articulate the ideas, barriers and opportunities to ensure government-supported change in the market can be accomplished efficiently. While government sets policies to drive change, ultimately, there is a need for people within the industry to initiate these changes. It will be important to ensure transparent communications between the public and private sector is in place, allowing for the smooth transition of technologies into the market.

Knowledge Sharing: Industry leaders need to have confidence they will have the support needed to respond to shifting markets. Government leaders need to ensure information is openly shared across the industry and that the tools and resources needed to change business models are readily available. Public-sector agencies and NGOs need to provide more resources to central repositories for sharing knowledge and encouraging network development. The Internet of Things has become a central driver for communications around the world. New high-tech communication systems would be effective at transforming the construction sector, and new methods for identifying trends, opportunities and barriers will help accelerate the adoption of systems and processes.

Technology Verification: To help drive adoption at the scale needed, governments should give greater authority and more resources to the testing and verification centers working to develop new technologies and encourage market adoption.



TABLE 7 Cross-Sector Collaboration:
Marketing, Communications and Network Engagement

In today's market, it is becoming increasingly important to create initiatives that break down professional sector silos and encourage a transformation toward a sustainable, low-carbon economy. New technologies and systems designed to improve the efficiencies of our cities are showing promise, but the building construction sector is slow to change. New strategies conducive to market collaboration must be implemented to meet our international climate change commitments.

Prompting the Discussion:

- 1 Considering buildings and infrastructure play such a dominant role in society, what is required of sector leaders to facilitate the adoption of new cleantech and materials? What are the barriers and opportunities in creating a new strategy through collaboration?
- 2 To meet Canada's commitments, industry leaders need to work together. This will require dedicated resources and collaboration in supply-chain management to ensure low-carbon strategies are met. How can the building construction industry work together to ensure carbon accounting results are supported during construction and Canada benefits from a unified carbon metric system for buildings?
- 3 Marketing and promotions can be a financial burden to companies. How can we manage financial resources and still celebrate successes to ensure industry leaders continue to search for ways to advance new opportunities in the marketplace?

Industry Observations:

Continue the Dialog: Leaders in the building construction sector play a key role in the advancement of new technologies and materials in high-performance buildings. It will be important to ensure ongoing and open dialogues takes place across complementary companies.

- Working in a new emerging market can cause businesses to hesitate; they are rightly protective of their resources. For executive leaders to feel confident enough to shift away from traditional practices, they need to know they are not alone and that markets will demand change over the long term.
- Industry leaders need to inform and educate the public sector about successes and failures. They need to demonstrate opportunities for commercial growth so governments can make informed decisions.

Celebrating Successes: Marketing and communications need to play a more central role in corporate strategies. The marketplace needs to understand new corporate directions, a companies' internal staff need the confidence of job security in a low-carbon economy. It is important project success does not get lost once a project is complete. As new technologies and systems are proving effective in reducing energy and emissions, it is the responsibility of corporations to share that with the market and encourage healthy competition for greater long-term results.



TABLE 8 Return on Investment:
Incentive Opportunities to Encourage Market Uptake

For Canada to meet international targets, it will take more than strategic direction—it will take action across the building construction sector to achieve results. Federal leaders in Canada recognize this and are preparing to make investments into green infrastructure a priority. New investment strategies are needed to achieve the aggressive high-performance, low-carbon building targets.

Prompting the Discussion:

- 1 Buildings can only be constructed to aggressive performance targets when clients are engaged and request this level of efficiency. How can the marketplace engage clients earlier in the planning process, and what type of incentive is required to hit the required performance targets? What does an attractive return on investment look like for clients?
- 2 Existing buildings are a concern in the marketplace, current energy conservation programs are having limited success. Are there ways to better align the interests of builders, owners, landlords and tenants so that all have a stake in energy efficient, sustainable buildings?
- 3 More than any other time in our urban development, we are seeing shared interests emerging across energy, city infrastructure and communication technologies. What investment opportunities and collaboration strategies should be considered to unite leaders across these sectors to grow a low-carbon economy for Canada?
- 4 Carbon pricing has grown to become a commodity market in excess of US\$50 billion across 40 nations. Is there an opportunity for buildings and infrastructure to benefit from carbon taxes and cap-and-trade protocols currently under development?



Industry Observations:

Next-Gen Incentive Programs: Programs led by energy utilities and government agencies have been successful for many years in Canada, but there are perceived barriers to wide scale market adoption. In many cases, efforts required to participate can be more than companies are willing to give. The next-generation of programs need to streamline administrative processes, increase the level of incentive and challenge program participants beyond current objectives. If cities are responsible for a large percent of the carbon emissions, there should be a strategy to apply gains from carbon taxes to incentivize large-scale demonstration projects. If taxpayers can see the results, they will understand the benefits and support further action.

Operating as Designed: High-performance buildings need mandatory commissioning services to be conducted on every project. This way clients can be confident their energy targets are met and systems are optimized for peak performance. Building owners should also be required to disclose operating energy costs at point of sale so the real-estate market can drive competition through proven performance metrics. Building performance should be integrated into property values.



This is a pro-growth policy, it's the key signal that we can send to the market and to our citizens that we're committed to the development of a low-carbon economy, and all the benefits that entails for our environment, our health, our security, and for global growth.

Justin Trudeau,
Prime Minister of Canada

An Industry Response Strategy

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As a result of the discussions, observations and recommendations provided at the Industry Leaders Workshop, we have established four initial action items that the Carbon Impact Initiative's partner companies will focus on as the first stage of our industry response strategy. The following action items will be used to guide the development of a number of projects meant to showcase how industry leaders can work together to meet Canada's international commitments on climate change.

We have pulled together some of Canada's most influential companies to demonstrate collaborative leadership and our commitment to transform markets, but we must recognize we cannot do it alone. We need a wide group of associates from across sectors to meet the targets set out through the Carbon Impact Initiative. As we develop projects through these action items, we will reach out to industry experts to join our efforts. We will explore new technologies and search for new methods of production and implementation. We will also work closely with all levels of government to combine resources and conduct international outreach through a united front.

The Carbon Impact Initiative will not be rolled out as a not-for-profit promotional strategy or advocacy position. We will be building projects, testing technologies and more through real-world applications and industry objectives. If markets are to shift in response to climate change, they must be guided by proven results that meet industry objectives. This means projects and strategies developed through this action plan must take into account how the companies involved will benefit from an appropriate return on investment for their contributions. We must test our response strategy against realistic applications—and demonstrate that Canadian businesses can thrive in a low-carbon economy.

The companies in the Carbon Impact Initiative are proven, bankable institutions with reputations built through years of growth and development in Canada and around the world. Together, we will show what it takes to lead the next generation of high-performance city building.

An Industry Response Strategy

Action Item 1:

Building the Next Generation of High-Performance Buildings and Infrastructure

We can no longer design city buildings to operate as independent, self-sufficient structures. New interactive technologies across communications, transportation and energy are demanding buildings interface with their surroundings. We also need to recognize that, as buildings become smarter, their energy demands will increase. This is a growing concern to local energy utilities struggling to respond to demand and manage peak loads. In effort to curb demand and upgrade aging utility infrastructure, energy costs will continue to rise and new conservation measures will be introduced to the market.

With the dramatic investment into renewable energy in recent years, a new building strategy has emerged that encourages owners to generate as much energy through renewable sources as they use. These Net Zero Energy buildings are rapidly gaining in popularity but the challenge is designing and constructing an envelope that can meet the stringent operating demands and appropriate budget expectations.

Net Zero Energy vs. Net Zero Emissions

For the purposes of this action plan, the terms “Net Zero Energy” and “Net Zero Emissions” work together as part of a unifying objective. To provide clarity, we offer the following definitions:

Net Zero Energy refers to a building that has the ability to produce or source as much renewable energy as it uses over the course of an operating year. According to the U.S. Department of Energy’s National Renewable Energy Laboratory (NREL) in Colorado,²² Net Zero Energy buildings can be achieved through the following strategies:

- **Net-zero site energy** produce on site at least as much renewable energy as used in a year.
- **Net-zero source energy** purchase at least as much renewable energy from a source (utility) as it uses in a year.
- **Net-zero energy costs** mean the amount of money the utility pays for exported renewable energy to the grid is equal or greater to the energy cost to operate the building over one year.

Net Zero Emissions is a fourth strategy offered by the NREL. It refers to a building that produces (or purchases) enough renewable energy to offset emissions from all energy required for annual operations. It is used in the context of carbon dioxide releasing processes associated with transportation, energy production and industrial processes. This action plan will be giving special attention to Net Zero Emission strategies in our efforts to reduce or offset carbon emissions during the process of construction and operations. This will include accounting for the embodied energy or carbon in the materials used during construction. Action Item 2 in this report will explore this strategy in greater detail.

Pilot Projects: Striving for Net Zero Energy and Emissions through Canada’s Commercial Buildings

Net Zero Energy is a relatively new concept for Canada’s building industry. Fortunately, the market for Net Zero Energy buildings is growing rapidly, and there are a number of leading projects being built around the world we can reference. In fact, according to Navigant Research, revenues in the global Net Zero Energy market is expected to grow from \$629.3 million in 2014 to \$1.4 trillion by 2035.²³

In Canada, a number of initiatives are underway to build single-family homes to meet Net Zero Energy requirements, but striving for these same targets for large-scale commercial buildings is a different matter. For commercial buildings, project developers need to pay special attention to a variety of factors and work together throughout the design-build process to achieve success.

- **Architects** need to account for fluctuations in environmental conditions and long-term use of the facility.
- **Engineers** need to right-size HVAC equipment and consider how occupants will interact with the smart technologies required to run the systems.
- **Contractors** need to give extra care to ensure the building envelope meets thermal conditions specified by the design team.
- **Building operators** need to go through detailed training on how to maintain peak efficiencies, and owners need to ensure tenants and facility managers continue to conserve resources over the life of the building.

Through the Carbon Impact Initiative, our partners have the resources and industry experience required to design, build and operate large-scale commercial buildings targeting Net Zero Energy. Together, we will develop a pilot program that will identify a select number of commercial projects across a variety of building types. We will then work with government agencies to identify potential incentive financing. We will also work with academic institutions for research and reporting opportunities. Through these combined efforts, we can ensure each project has the resources required to meet their targets and effectively report on the outcomes for next-stage developments.

This pilot project will ensure the buildings selected for participation will target the highest levels of performance of Net Zero Energy and dramatically reduce carbon output during construction and operation. This project will also track the embodied carbon identified through the supply chain and construction process. After construction, the buildings will be used as living labs to report back on performance to ensure they meet objectives.

Once we take a number of projects through this pilot program, we will be well positioned to explore new solutions and respond efficiently to the demand for Net Zero Energy development. We will be able to move beyond individual buildings and work closely with our counterparts in the energy, infrastructure and technology sectors to design and build urban centres as integrated systems that can respond to future resource demands and climate change impacts. This will be the first step toward effective and practical resilient city planning for Canada. ■

WSP Canada

As carbon emissions are increasingly restricted by changing regulations and public expectations, city infrastructure will go through a process of renewal, with a primary focus on mobility and buildings.

Transportation is the second largest source of emissions in Canada, it is also a sector that is in the midst of radical change due to smart technology, physical constraints, and social demands. At WSP, we are delivering smart, resilient, transit and rail for the movement of goods and people; and telecommunications for the movement of ideas. Both are low energy, high service systems that increase the density and efficiency of cities. They are aligned with a low carbon future.

Electricity and buildings are the third and fourth largest sources of carbon emissions in Canada. The WSP Buildings team has been designing, and verifying the performance of the lowest energy buildings in Canada for over a decade. We are now creating net zero buildings. These require ultra-low energy consumption and they require the developer/owner to generate the energy needed to run their building. We see the net zero building as an interim step to low carbon cities. Our team includes global experts in community energy systems, distributed generation, smart cities and strategic planning. We are helping clients make the most efficient use of available resources, capital and talent while delivering lower carbon emissions, lower energy costs and greater resilience for our cities.

STRATEGY

An Industry Response Strategy

Action Item 2: Carbon Accounting

The provinces in Canada have recently joined a growing number of U.S. states to begin the process of putting a price on carbon. This move will not just set the stage for new opportunities for Canada, it means Canadians can have a real influence in international climate negotiations. But we have a long way to go.

More than 40 national jurisdictions are implementing some form of carbon pricing to combat climate disruption and manage our natural resources. Low-carbon economics has become a unifying agenda for industry and governments around the world. A low-carbon economy represents a shift in professional values; it means growing employment in an emerging market and the introduction of new technologies across sectors.

From a buildings and infrastructure perspective, we need a full value chain accounting of the carbon emissions contributed through the construction process. We need to track process emissions and we also need to account for the embodied carbon resulting from the manufacturing of the products and materials used.



A Carbon Modelling Tool

We will be working with partners and associates to develop a tool that will allow us to track greenhouse-gas emissions in the field. As we continue to build our cities and communities, we want to understand the true carbon impact as a result of construction. Once we understand the impact, we will be able to make informed decisions about how to reduce or offset emissions.

Eventually, we will be able to establish emission targets for construction projects early in the design stage. So for example, if a client requires a net-zero carbon building or if we need to track project emissions to meet mandatory requirements, we will do so with confidence and efficiency in the field to keep project schedules on track.

In our efforts, we will be following the GHG Protocol,²⁵ an internationally recognized standard developed by the World Resources Institute and the World Business Council for Sustainable Development. It provides the consistency of scoping practices and processes for nearly every greenhouse-gas standard and program in the world, including the International Standards Organization.

The GHG Protocol states emissions are divided into three categories, or scopes:

Scope 1: Comprises all direct sources of emissions including fuel combustion from heating, fleet vehicles and equipment

Scope 2: Includes purchased electricity, heat and steam.

Scope 3: Comprises all other indirect emissions: materials use, waste disposal to landfill, transport of people and goods and other. ■



Businesses should
prepare for a second
industrial revolution [...] carbon will become
part of the daily
currency of business.

Dr. Gary Felgate, The Carbon Trust

Enbridge Gas

As a North American leader in energy infrastructure systems that deliver oil, natural gas and renewable energy, Enbridge is uniquely positioned to help the transition to a lower carbon future. Natural gas is an available and affordable replacement fuel for coal in electricity generation and an important enabler of renewable and community scale energy. Enbridge is actively collaborating with industry partners to reduce GHG emissions across energy production, transportation and end use.

Since Enbridge's initial investment in a wind farm in 2002, it has invested nearly \$5 billion in wind, solar, geothermal, hydropower and waste heat recovery projects. Together these projects, operating, planned or under construction, represent nearly 2,700 MW of green power capacity. This is enough to meet the electricity needs of more than one million homes. Today, Enbridge is one of the largest renewable energy companies in Canada, and its portfolio of renewable energy projects is diversified and growing, with a plan to double its renewable investment in the next five years.

Enbridge Gas conservation programs have collectively helped Ontario residents and businesses avoid 18 million tonnes of GHG emissions. By 2011 Enbridge Gas also reduced its own emissions below 1990 levels and 75% of its own fleet vehicles run on natural gas, reducing emissions by 400 tonnes of CO₂e per year. Enbridge will continue to work with industry leaders to advance energy technology innovation, support economic goals and provide solutions in addressing climate change.

STRATEGY

An Industry Response Strategy

Action Item 3:

Cleantech Innovation: Adoption through Testing and Verification

In order for the next generation of low-carbon buildings and infrastructure to take hold in Canada, we need to work on the adoption of new technologies, materials and processes required to meet demand. Unlike other industries, the engineering and construction sector has been slow to adopt new technologies and has never undergone a major transformation. As a result, productivity has stagnated over the past 40 years—or in some cases, even declined.²⁶

One of the barriers to change has been the service lifespan expected from the technologies integrated into buildings. Technologies developed through the electronics and automotive sectors are replaced every three to five years, but buildings and infrastructure are built to last decades. This can be a good thing if we consider the financial and resource cost of city building and the amount of waste produced when a building is demolished. The downside is that developers are always concerned about reliability and can be reluctant to adopt a new technology. An engineer never wants to find out a technology they specified is failing to perform as expected.

Cost is another major barrier for adoption. A lot of technologies might be perfect for a given application, but if the cost far exceeds a traditional, established technology, clients will be hesitant to make the switch. The primary way to overcome cost barriers is to prove an acceptable return on investment, but even then, the struggle between up-front cost and long-term savings has been an ongoing debate in the marketplace for years.

Technology Testing and Verification Centres

To encourage the adoption of new technologies into buildings and infrastructure, we need to build confidence these products will perform to industry expectations. We also need to work with developers to minimize costs and support entry to market strategies. To accomplish this, we can follow some of the practices used across the high-tech sector to commercialize new digital technologies. There are a number of well-recognized “incubation centres” across Canada and in the United States demonstrating great success in bringing new technologies to market. These incubation centres test new technologies and work with legal and financial institutions to assist with product development.

As leaders in the Canadian marketplace, our Carbon Impact Initiative partners have an opportunity to source the best emerging clean technologies available to the market. Together, we could develop a plan that allows us to test the performance of these new technologies and materials specifically designed for the built environment. This might be best served by partnering with an established incubation centre; by creating a network across a number of existing centres; or by establishing a new Canadian technology test centre to meet the needs of the partners involved.

Engaging Academia

We also need to establish a preliminary evaluation process new products and technologies need to go through before they become eligible for performance testing. We could work with academic post-secondary affiliates to administer this process before engaging with the technology companies involved. Approved applicants would then work with partnering test centres for next-step developments as needed. Our academic partners would also work with us to develop an online portal system that unifies research conducted by our testing centres specific to building construction and energy management.



Outcomes

Our ultimate goal is to develop confidence in a wide variety of new technologies and materials that can make our transition to high-performance building systems as efficient as possible. The global market is moving fast to introduce newly commercialized clean technologies, and Canada is in a position of having to catch up to European energy-efficiency targets.

The ongoing concern for us as we strive to adopt new technologies will continue to be long-term reliability. By working together to test new products, we will be able to understand the opportunities and issues and transfer knowledge to the clients we serve. ■

Cisco Systems

Owners, operators and occupiers are increasingly aware they need to make decisions to deploy solutions that make good use of capital costs and allow for continuous operational improvements while decreasing a building’s environmental footprint. A deep green, smart building has a streamlined infrastructure that does not rely on proprietary communication methods that lock data within traditional siloes. Instead, building systems can now be connected to a single building network for easy access to data and decreased integration costs.

It is estimated that 75 per cent of a building’s lifecycle costs and GHG emissions occur during the operational phase. Connected systems make it easier to track and maintain building performance levels before issues become noticeable to users. For example, digital lighting can leverage LED energy efficiency and sensing capabilities to lower energy use by up to 90 per cent over traditional fluorescent-controlled lighting.

A connected building can provide smart experiences that break down barriers between building and IT systems. In a smart building, workspaces are designed to increase collaboration, reduce the amount of required space and take advantage of the pervasive mobility and connectivity that is increasingly being demanded by tenants, guests, visitors and other building users.

Cisco enables innovation in each phase of a building’s life cycle and we have a long track record in providing network solutions that drive secure business outcomes for customers. These solutions are intended to provide flexibility and increase resilience for building owners and operators as rapid business digitization continues to change market and environment for the better.

STRATEGY

An Industry Response Strategy

Action Item 4: Return on Investment

Many companies around the world have factored in the potential impact climate change will have on their business. Key drivers for their efforts include volatile weather conditions, resource scarcity, changing customer needs, potential legislation and the expected impact carbon pricing will have on the market. Leading companies that get ahead of this shift toward a low-carbon economy are recognizing the benefits and long-term value for shareholders. They are investing now in projects that will help them prepare for the future.

Businesses must find responsible ways to deliver substantial returns for their shareholders. Low-carbon investments give them this opportunity—and some are taking it. The key is to make sure all businesses reap these rewards.²⁸

We Mean Business Coalition

The low-carbon economy is well underway, but we are only at the beginning. Research demonstrates most companies are not yet setting targets in line with climate science, and more ambitious targets will be needed over the coming years, particularly in regions with high historic and projected future levels of carbon emissions (Europe, the United States and China) and within the high-emission business sectors (utilities and heavy industry).²⁷ There is a lot of work to be done, but this can be a good thing for companies striving to lead their sectors and maximize potential returns.

To ensure private-sector commitments toward a low-carbon economy can rise up to the recommended efforts required to meet international emission targets, public policy leaders need to respect and appreciate the need of the private sector to achieve an appropriate return on investment. Although financial incentives will always stand as the primary goal, return on investment can come in many forms, including leadership recognition, access to new clients and markets, project development efficiencies, and more. Collectively, these can be very important for long-term business growth.

Through this action plan, the partner companies driving the Carbon Impact Initiative have already proven themselves as energy and environmental champions in Canada. By coming together, we can take projects to a new level of energy efficiency and technological sophistication rarely seen to date in Canada. We have the expertise required to take a building or infrastructure project from planning and design through to construction, operation and maintenance over the life cycle of the project. We have the tools needed to meet Canada's commitment to international emission reduction targets, and we have the resources required to prepare our cities for next-generation technologies.



Incentives

What we need is an effective engagement plan and incentive strategy to encourage clients to take their projects to the next level of efficiency. Through the Carbon Impact Initiative, we will review established financing and investment strategies used to encourage the adoption of new technologies in the market. We will then work in collaboration with government agencies and financial institutions to develop new funding models that can incentivize a transition to a low-carbon economy for Canada. We will also work with existing funding agencies to establish a grant and loan database so clients can have access to the resources needed for success.

Energy utilities will continue to play a central role in efforts to switch from fossil-fuel-based systems and advance conservation efforts. We will work closely with energy utilities across Canada to understand the low-carbon energy opportunities available and integrate their demand-side management initiatives into our projects. We also want to work with technology commercialization leaders in Canada to assist with the business growth of small to medium-sized businesses developing the cleantech needed to meet efficiency targets. ■

BASF Canada

A multinational Company's Transition to a Low Carbon Economy

Sustainability is a driving force for BASF's activities in the construction sector. Chemistry can help to improve energy efficiency, increase durability and helps speed construction. Part of our contribution to sustainable construction is providing expertise and solutions from raw materials and formulations to end products and systems—many of which facilitate GHG reduction.

At BASF, we believe a key part of the transition to a global low-carbon economy will be the development of cost competitive technologies that will drive emissions reductions. Together with approximately 60 other companies, BASF signed the "Business proposals in view of a 2015 international climate change agreement at the COP 21 in Paris". BASF is also part of the United Nations Caring for Climate initiative.

Looking forward, BASF is focusing on research and taking measures to help to reduce greenhouse gas emissions. We aim to reduce global GHG emissions by 40% per metric ton of sales product by 2020 vs. 2002, which involves optimizing energy supply and production processes.

BASF is also working to enhance the sustainability performance of our portfolio. BASF's Sustainable Solution Steering™ method looks at the entire value chain to assess the overall sustainability contribution of BASF products. Accelerator products contribute particularly to sustainability in the value chain, and are characterized by, on average, higher growth rates and profitability. The goal is to raise the proportion of sales from Accelerator products to 28%, by 2020.

STRATEGY



With better information as a foundation, we can build a virtuous circle of better understanding of tomorrow's risks, better pricing for investors, better decisions by policymakers, and a smoother transition to a lower carbon economy.

Mark Carney, Bank of England

Concluding Remarks

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At the end of 2015, Bank of England governor Mark Carney (previously the governor of the Bank of Canada) gave a remarkable speech in front of the world's largest network of investors to illustrate that the financial sector is actually moving faster to develop the global carbon market than government leaders are able to set policy and legislation. He used the Montreal Carbon Pledge to drive home his point. In a little over a year, the Montreal Carbon Pledge has been signed by 120 investors from around the world that control more than US\$10 trillion in assets to measure and disclose the carbon footprint of their portfolios.

Not only do these investors control vast amounts of cash, they are rapidly changing the structure of global energy economies. Carney also chairs the international Financial Stability Board and recently used this platform to warn the insurance sector about the serious risks climate change poses to investors. He stated investors have a fiduciary responsibility to prepare for an "abrupt transition" and emphasized the urgency in preparing to function in a low-carbon economy.³⁰

The Carbon Impact Initiative is about leading Canada toward this low-carbon economy Mark Carney identified. Our industry leaders must begin the rapid transition in our economy and work with our public-sector counterparts to keep pace with international objectives. In doing so, we will establish a competitive advantage in the market. We will have direct access to new economic opportunities and an intimate understanding of the technologies and systems required to deliver on our commitments.

As noted throughout this report, we cannot deliver on Canada's commitment to climate change alone. This needs to be a collaborative effort that ensures an appropriate return on investment for the companies involved. The Carbon Impact Initiative has set the stage for how building, energy and infrastructure projects play an integral part in our emission-reduction strategies—but this is by no means a one-time effort.

This report is the first in a series of products we will be developing to drive our Low Carbon Agenda forward. From here, we will grow our list of corporate affiliates, develop formal project proposals based on the four action items identified and connect with potential clients to put projects in the ground that effectively represent the efficiency targets required to succeed in a low-carbon economy. ■

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Endnotes

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Workshop Attendees

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The Carbon Impact Initiative Action Plan represents a holistic approach to a complicated challenge. It is critical that collaborative partnerships of this nature be created to tackle the climate change agenda. Sustainable Buildings Canada is pleased to support EllisDon and the program partners. We strongly believe that the buildings marketplace can drive realistic solutions for lasting low carbon impacts.

Michael Singleton,
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Founding Partners of the Carbon Impact Initiative:



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