MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE

ONTARIO'S CLIMATE CHANGE DISCUSSION PAPER 2015

Ontario

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Minister's Message

Climate change is *the critical issue* of our time.

Two numbers that are vital for Ontarians to be aware of: **4,** the number of degrees in this century that the planet is on track to warm by, and **6,** the number, in trillions of dollars of new economic growth that will result from moving to a low-carbon economy.

A 4 degree increase in the mean temperature of our planet will have catastrophic consequences. Severe weather events are already driving up insurance costs and severely damaging our infrastructure. Food security and costs will be an early problem as climate change impacts where our food is grown and affects our water supply.

Climate change is a problem with a solution. Reducing our carbon emissions will produce a new innovation economy in Ontario. Building on our early leadership in sustainable technology and innovation, Ontario is well positioned to seize the opportunities of a low-carbon economy if we are prepared to take bold action.

Reducing our energy costs through the establishment of new building standards, and the use of new technologies, will enable us to reduce the emissions from our homes.

Moving to low-carbon and zero emission transportation options will allow us to move to and from our homes and jobs more efficiently, while improving the air we breathe and growing our manufacturing sector.

The new low-carbon economy will mean more and better jobs. It will avoid an environmental crisis and secure our future as a global green service and industrial economy leader.

We have already made great strides by eliminating coal power generation in Ontario, strengthening our building code, and beginning to electrify GO transit, but there is much more that must be done. We know we can do this and your participation in developing this strategy is essential to our success.

Glen Murray
Minister of the Environment
and Climate Change

Introduction

Climate change is already underway. Fourteen of the first fifteen years of this century have been the warmest on record.[1] Around the world, climate change is leading to an increasing number of extreme weather events, destroying infrastructure, having impacts on agriculture and threatening the biodiversity of the planet. Extreme weather events are just one aspect of a changing climate and scientists tell us that extreme weather is now part of the new "normal".

Here in Ontario, we have already felt some of these effects in the form of ice storms, severe flooding and millions of dollars in damage to our infrastructure. These losses are not sustainable and demonstrate that the cost of doing nothing is high. Payouts from extreme weather events have more than doubled every five to 10 years since the 1980s, and in 2013, losses were a historic $3.2 billion as a result of floods in Alberta and Toronto.[2]

In our Far North, climate change is already impacting access to remote communities as winter roads are becoming harder to establish and maintain. It is impacting sensitive ecosystems in the peat lands and boreal forests. Severe weather anomalies in North America are already causing some produce shortages in Ontario stores. We have also seen grocery stores post notices that produce is unavailable from parts of North America as a result of severe weather events in other regions. If left unchecked, climate change threatens our communities, our farms, our health, our economy and all of the natural systems that underpin them.

While there is recognition that climate change is a significant human induced problem, after 20 years of international negotiations we are using more energy, more fossil fuels and we are emitting more greenhouse gases than at any time in history.[3] If governments do not take strong action to reduce global emissions within the next decade, we will see at least a 4°C rise in global temperatures which, while appearing to be a small difference, will in reality trigger irreversible damage to the ecology of our planet.[4]

In Ontario, we can be proud to have already established the province as a climate change leader. Based on current data, we exceeded our 2014 carbon emissions reduction targets, eliminated coal-fired electricity generation, and have begun the process of electrifying large parts of our transportation system. We are working with the Compact of States and Regions to report on our reductions transparently. And, we have joined with British Columbia, California and Quebec in a process to establish a new interim greenhouse gas reduction target. Yet, at less than 1 per cent of global emissions, Ontario is still among the largest per capita emitters of greenhouse gases in the world. As climate change leaders there is much more we must do.

To avoid irreversible climate change impacts, the international community has determined that emissions of greenhouse gases need to be reduced by 80 per cent by 2050 and neutralized in the second half of this century.[5] Our emissions targets in Ontario already align with these objectives. Our energy must come from lower emission sources and more renewables than it did in decades past. Our buildings and communities will increasingly need to be designed with their energy consumption and carbon emissions in mind. A broader range of competitive transportation options, including low carbon and zero emission choices, will be needed. We must work with our

industrial sector to focus on increasingly innovative and productive ways to use energy and capital to reduce emissions, and to produce more of the low-carbon goods and services that will be in demand in the new global economy.

Climate change is not a discrete problem. Whether it is mitigation or adaptation, no single factor can be considered in isolation. The Intergovernmental Panel on Climate Change has noted that if emissions are not reduced, it will have a negative impact on our ability to adapt – the two factors are connected. In this light, our mitigation efforts are as important as our adaptation initiatives and these must be monitored over time to ensure the balance between the two is optimum.

At the New York Climate Summit in September 2014, John Kerry talked about how the new green industrial economy – a six trillion dollar economic expansion – is within reach.[6] The solution is not to protect the old ways that used carbon intensive energy resources. The solution is to build on the strong foundations we have established in Ontario, to innovate and invest in a high productivity economy that values our natural capital and acknowledges the costs of our impact on the climate and start on a path to sustainable prosperity. Where subsidies exist that have led to sustaining high levels of carbon emissions, they should be re-examined. Mechanisms that support firms that continue to clean and green their production should also be considered.

We are just at the beginning of this transition and Ontario is well positioned to lead but we can't do it alone.

Solutions may include new science, new technology and products and services that are essential for a low-carbon economy to thrive. Ontario wants to be a leader in this low-carbon future and capitalise on this tremendous opportunity. Our vision for the long term is redesigning and building strong carbon neutral communities, infrastructure, and energy. Moving to a carbon neutral society and economy will allow for growth and prosperity while leaving a legacy of a healthy world for our children and our children's children and protecting our ecosystems, including air, land and water. Getting there requires immediate climate critical actions.

> Secretary-General of United Nations Ban Ki-moon: The clear and present danger of climate change means we cannot burn our way to prosperity. We already rely too heavily on fossil fuels. We need to find a new, sustainable path to the future we want. We need a clean industrial revolution.[7]

We want to work with individuals and organizations who have the expertise and ideas we need to forge ahead. We also want to work with municipal, community and industry leaders who share our goal for a clean and prosperous future. We recognize and support the role of industry and manufacturing in Ontario and realize that working closely with the sector will be an important part of Ontario's ability to achieve its targets. Likewise, industry will play a vital role in supporting Ontario through the transition to a low carbon economy.

The purpose of this discussion document is to resume a conversation among the people of Ontario about climate change and the continuing leadership role our province can play. We plan to engage First Nations and Métis communities from across Ontario in a focused conversation to work together to address climate impacts and climate change.

We plan to consider all of the feedback we receive on this discussion document and incorporate these ideas and others into a comprehensive strategy that will allow us to help Ontarians adapt to climate change, meet our emissions reduction target for 2020 of being 15 per cent below 1990 emission levels, achieve 80 per cent reductions by 2050 while working toward carbon neutrality by the end of the century.

We ask that you read this discussion paper and focus on the questions that are provided at the end of the document. We know that our province's greatest strength is our people. We look forward to hearing from you as we work to develop a strategy that will allow us to achieve our goal of a healthy, prosperous province recognized as a world leader in climate change solutions.

SECTION 1

Climate Change: A Plan for Ontario's Future

10 guiding principles for achieving a low-carbon economy.

Climate Change: A Plan for Ontario's Future

Ontario can reduce our emissions and adapt to climate change if we follow a plan and work together for a common goal and the common good. In order to guide our efforts, we need to align our plan for the future with a set of principles that can guide and enable us to achieve our goal over time. Our vision is clear:

10 Guiding principles for achieving a low carbon economy

In order to accomplish this, we have identified ten guiding principles that will allow us to achieve the Ontario government's early and long term goals:

Action Oriented	Leadership	Learning	Scientific	Economically Integrated
Science shows we must act now and that the longer we delay, the larger the problem will be. Ontario is committed to moving quickly to achieve results.	Ontario will establish innovative mitigation initiatives and become an active and leading player on the international stage.	We will learn from our partners and draw on best practices from other jurisdictions. Sharing knowledge and expertise will form a large part of our transformation to a low carbon economy.	We will support significant new technologies and innovations that contribute to global solutions for mitigation and adaptation and develop Ontario's green sector.	Good environmental policy is good economic policy. We will integrate economic and environmental considerations into our decision-making process that consider the risks associated with a changing climate.

Market-Based and Productive	Well-built	Adaptive	Collaborative	Assessing Risk
We will address Ontario's needs for a low-carbon economic transition and explore the use of market based instruments to make that possible.	We will be "climate-smart" about existing and new infrastructure and plan for connected low-carbon com-munities and buildings.	We will remain flexible and adapt to changes in our climate as we build and invest for the future.	We will work with all levels of government, local municipalities, public and private sector concerns, First Nations and Métis communities and individuals to achieve our vision. Every sector of our province has a role to play. We will also work on the international and sub-national levels to achieve meaningful agreements on reducing global greenhouse gas emissions.	We will set targets, conduct risk analysis, track our progress, and communicate our progress to the public. We will gain a better understanding of climate risks and the costs of inaction.

SECTION 2

Long-term Goal: Transformation

A discussion of goals and objectives for achieving Ontario's climate change vision.

Long-term Goal: Transformation

Transforming our economy and communities to ones that are low-carbon and resilient to the impacts of climate change is possible. It is not only possible, it is necessary. In fact, managing the risks of climate change is the only path to sustained long-term economic growth.

The task is significant but the benefits will be healthier, more liveable communities, cleaner air, and a prosperous and innovative economy. To avoid dangerous climate change, global greenhouse gas emissions need to stabilize in 5-10 years, reduce dramatically by 2050 and approach zero by the second half of the century.[8]

Emissions reductions of this magnitude require us to make different choices and build new patterns, technologies, and systems into how we produce and use energy; how we organize and connect our communities; how we produce and move goods; and how we manage our lands and resources.

This transformation will take time but can happen more quickly than we expect. We need to stabilize and reduce emissions across all sectors by decoupling economic and emissions growth, and using technologies that exist now in clean energy and energy conservation. The longer term transformation will require basic research in breakthrough science and technologies that few can imagine at this moment in time.

This section looks at the key features of this transformation:

- **Leadership and collaboration** with our trading partners and learning from leading jurisdictions;
- **Economic growth** that is based on multi-factor productivity – the productive use of our human, natural, social, manufactured and financial capital. It is growth without carbon subsidies that is decoupled from greenhouse gas emissions;
- **Research and innovation** for the breakthroughs in science and technology that will be required;
- **Managing risks** of the climatic changes in our province and improving our resilience to these changes; and
- **Well-built communities** across the province that are strong liveable and healthy.

Leadership and Collaboration

Through educational choices and collective actions, we have worked together to achieve many major environment successes; removing lead from gasoline, reducing acid rain, eliminating ozone depleting substances from the atmosphere and protecting green space. The urgency of climate change means that all states and citizens must and can act now.

Individual and Community Leadership

More than ever, individual Ontarians are registering their concern through actions at home and at work. We're conserving more energy, taking public transit more often, reusing and recycling at home and at work, and protecting our local water, green spaces, and natural resources. Personal and household choices are powerful and have the ability to drive where people live and how people travel between work, school and home. Together, buildings and transportation are currently the most significant contributors to Ontario's emissions.[9] Individual leadership through low carbon choices can help reduce emissions in these areas.

Individuals and communities also recognize that moral obligation can help create a no-go threshold for increased greenhouse gas emissions. As a party to the United Nations Framework Convention on Climate Change the Government of Canada has committed to the moral principle of intergenerational equality: Article 3(1) states that "The Parties should protect the climate system for the benefit of present and future generations of humankind…"[10] This principle enjoys strong support among Canadians, with 84 per cent of Canadians agreeing that, "Rich countries like Canada have a moral obligation to show international leadership by reducing their greenhouse gas emissions."[11]

Private Sector Leadership

The private sector is also demonstrating leadership on climate change. Organizations across sectors have demonstrated strong leadership to be more sustainable and reduce greenhouse gas emissions. Businesses are increasingly evaluating and disclosing climate risks to their operations and investments, considering carbon pricing in financial decisions, improving energy efficiency, purchasing renewable energy and managing the carbon footprint of their operations and supply chains. Around the world and here in Ontario, companies are pursuing efficiency and productivity in all of their factors of production, including energy and resources. They know that doing so is good for their bottom line and for the environment. The auto sector in particular has demonstrated their commitment to reducing the carbon footprint of their manufacturing and assembly operations. It is part of their effort to reduce waste and divert resources to productive use. This leadership from Ontario-based companies and those with operations in Ontario needs to continue to expand.

ONTARIO SUSTAINABILITY LEADERS IN GLOBAL (100) RANK

- Enbridge **(64)**
- Sun Life Financial **(67)**
- TD Bank **(76)**
- Bank of Montreal **(86)**
- Intact Financial **(98)**

In its recently released report, Caring for Climate (C4C) recognized companies that undertake initiatives to reduce their carbon footprint.[12] Out of 390 large, small and medium business located worldwide, 21 per cent are located in the Americas. In addition, of the Global 100 most sustainable companies in the world, five are headquartered in Ontario (see **box above**).[13]

Several multinational companies with operations in Ontario have shown their support for carbon pricing ahead of the UN climate summit in New York by aligning with various statements such as the Put a Price on Carbon statement initiated by the World Bank. Companies include Aviva, Munich Re, Swiss Re, Holcim Ltd., Nestlé, Philips Lighting, Royal Dutch Shell and several others.[14]

There is a growing network of private investors, public pension funds and asset managers that are signatories to the UN-supported network called the Principles of Responsible Investment.[15] The principles include greening operations, considering environmental impacts and also reporting on how these principles were integrated. Great potential exists for these environmentally and socially minded pension funds and investors to increase low-carbon investments and assets. In Ontario, for example, TD Asset Management, the Ontario's Teacher Pension Plan and the Health Care of Ontario Pension Plan are all signatories and committed to environmentally responsible principles of investment.

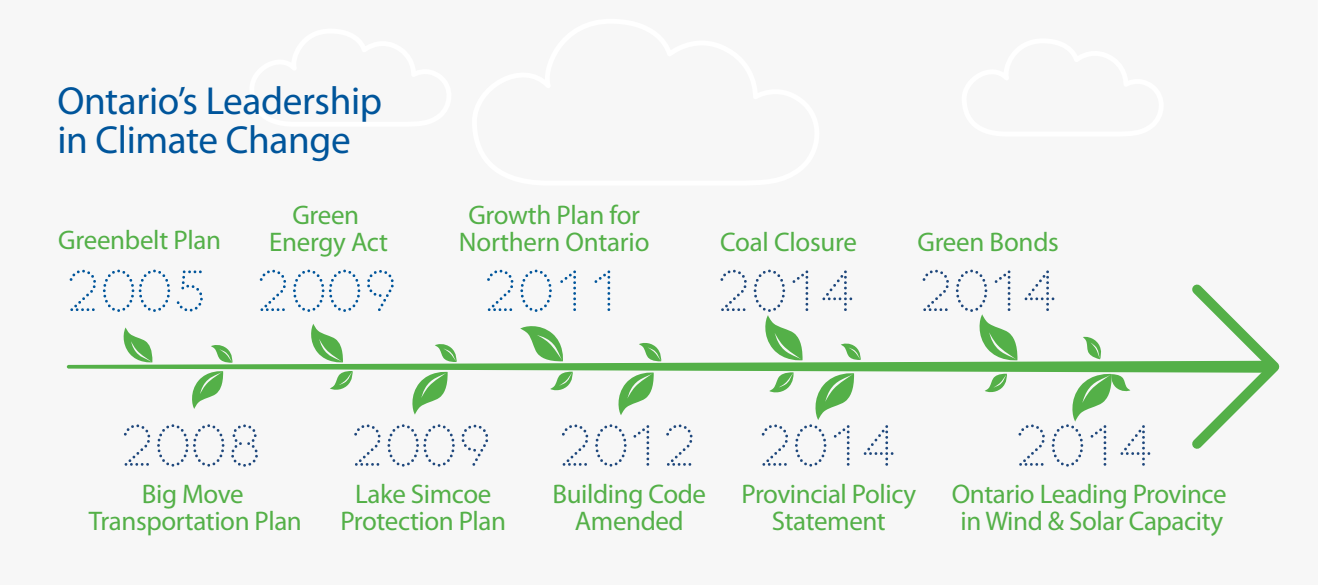
Governments have a role to build on the leadership taking place in the private sector and demonstrated everyday by communities and individuals.

Government Leadership

Ontario has demonstrated leadership in significant areas to reduce greenhouse gas emissions. Ontario's Climate Change Update 2014 confirms that based on the current data, the province is on track to meet its 2014 greenhouse gas emissions target and achieve nearly 70 per cent of the reductions needed to reach our 2020 target.

To remain climate leaders, our efforts must expand across Ontario – in each region of the province, across all economic sectors, and by helping all Ontarians realize that they have a role to play in reducing carbon emissions and in preparing for a changing climate. On the international stage, Ontario can continue to lead global efforts by encouraging other jurisdictions to set effective carbon reduction targets; by investing in the best science and technology to help our economy;

FIGURE 1 Timeline of Ontario's top 8-10 initiatives in climate change that demonstrate leadership



through exports to other states and regions, by reducing fossil fuel use; by putting a price on carbon; and by establishing new interim emission reduction targets. Collaborating with and learning from other leading jurisdictions – such as Quebec and California – will build stronger action and help create a level-playing field with our trading partners.

Through efforts with other leading jurisdictions, Ontario is creating momentum towards a strong international climate agreement. In December 2014 at the United Nations Framework Convention on Climate Change (UNFCCC) 20th Conference of the Parties in Lima, Peru, Ontario:

- Joined California, Quebec and British Columbia and committed to collaborate on mid-term GHG emissions reductions.
- Committed to increasing transparency and reporting publicly on greenhouse gas emissions annually by becoming a member of The Climate Group States & Regions Alliance Steering Committee and by joining the Compact of States and Regions.
- Built momentum towards climate change action and setting targets, by announcing that Ontario will host a Climate Summit of the Americas in Toronto in July 2015. The summit will bring together pan-American jurisdictions, as well as environmental groups and industry, to work towards common approaches to reducing greenhouse gas emissions through broader adoption of carbon pricing mechanisms.

From eliminating coal in Ontario to pricing carbon in British Columbia, from including climate change in the Canadian Energy Strategy to preserving large areas that act as carbon sinks, Canada's provinces and territories are leaders in climate change action. A strong federal partner is critical to ensuring that these actions are embedded in an ambitious and fully considered national plan that ensures emissions reductions across the economy. Municipalities also have a role to play. Municipalities have been leaders in adopting climate change actions and in involving their communities to develop mitigation and adaptation strategies.

Major players are already acting with the goal of achieving an ambitious global agreement on climate change at the 21st Conference of the Parties in Paris. China, the United States, and the European Union each forged new actions and agreements in 2014.

Acting now in partnership with other jurisdictions can: avoid exponential costs later due to climate impacts and lost economic opportunities; help define and establish rules of global collaboration; position sectors across the economy to reap the benefits of technology leadership in solutions that have applications in new global markets for low-carbon goods, services, and technologies.

Ontario already has programs and policies in place that help reduce emissions. In addition to the elimination of coal electricity generation, energy conservation programs aim to reduce emissions from homes and building. Our Growth Plan seeks to establish compact, complete communities and transit investment are attempts to encourage transit-oriented design. Building code changes that came into effect this year mandate improved energy efficiency. However, while these efforts will reduce emissions they are not sufficient to achieve our targets. We know we need to go further, and look at how to make policies likes these more effective at reducing emissions and will consider what new policies and programs we need to put in place and will examine other planning initiatives of government, such as the long term capital and infrastructure plan, Building Together, to ensure that carbon emission impacts of public investments are considered.

Transforming Economic Growth

We are at an important point in history. Amidst global economic uncertainty, volatile energy prices, structural and technological shifts in our economies, concerns about jobs and competitiveness, we have some fundamental choices to make. Do we continue to support a high carbon economy and society, built on expanding our use of traditional fossil fuels and increasing the risk of dangerous climate change, or can we envision a prosperous, sustainable future built on a new model of economic growth? The risks of a high carbon economy can be reduced with a new, clean, low-carbon economy (See **Figure 2**), one that:

- Avoids subsidizing the high carbon, low productivity economy:
- Aligns economic signals, incentives and investment with climate change objectives and supports innovation, the creation of new business models, products and services, and trade opportunities;
- Pollutes less, wastes less and makes more productive use of energy and natural capital (e.g. mineral resources, forests, soils); and,
- Is built on low-carbon and climate resilient infrastructure.

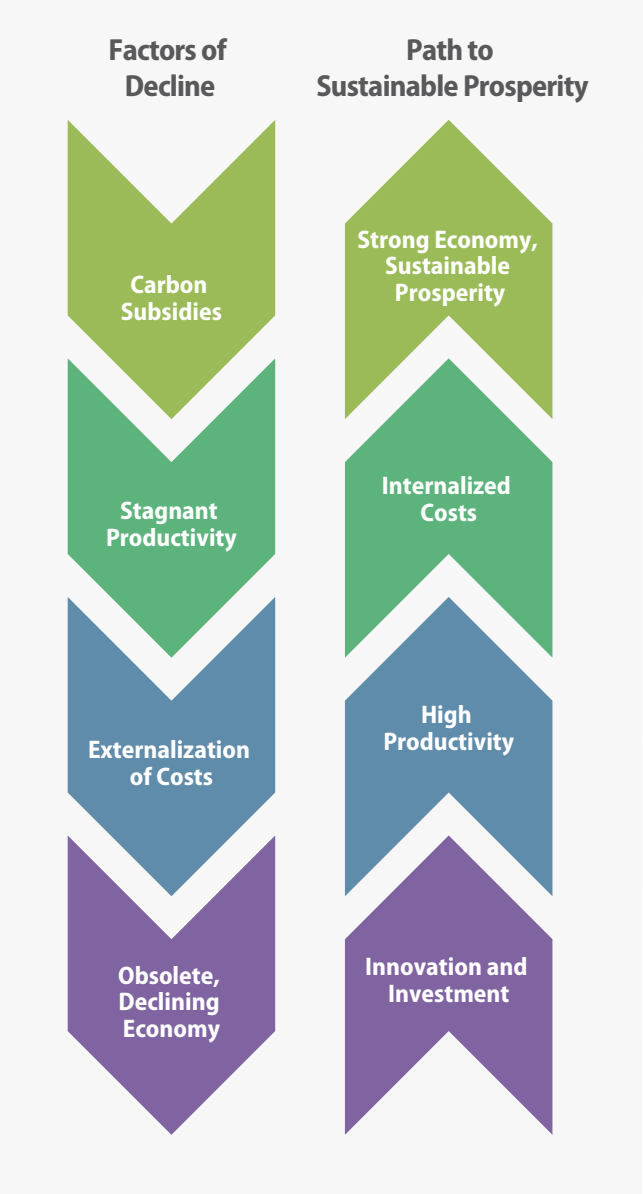
CANADA MOVING UP IN THE RANKS

In 2013, Canada Moved up in the clean energy investment ranking. China, India and the European Union invested the following amounts in ($billions) in clean energy in 2013:

Rank	Country	$ Invested
1	China	$54.2
5	EU	$11.5
7	Canada	$6.5
8	India	$6.0

(Pew Charitable Trusts: Who is winning the clean tech race 2013 http://www.pewtrusts.org/en/research-and-analysis/reports/2014/04/03/whos-winning-the-clean-energy-race-2013)

FIGURE 2 Alternate Paths



Perhaps the most important economic signal is a price on carbon, which would begin to assign monetary value to greenhouse gas emissions. Lord Nicholas Stern referred to climate change as "the greatest market failure that the world has seen" because we treat the atmosphere as a free dumping ground and do

not account for the damages caused by greenhouse gases.[16] Correcting this market failure by pricing carbon is one of the key economic signals to drive investment in low-carbon innovation. Globally, subsidies for petroleum products to the tune of $480 billion in 2011 continue to exacerbate this market failure.[17]

In addition, since many aspects of our natural systems do not have an explicit market price, these valuable forms of natural capital are currently invisible in the way we measure economic growth and productivity. Better accounting for natural capital's role in economic production will improve our understanding of the many ways our natural systems support the economy and how environmental changes could impact Ontario's longer-term prosperity.

The New Climate Economy Report 2014[18] estimates that $6 trillion per year will be spent to meet global infrastructure needs over the next 15 years, representing what John Kerry called "the mother of all markets". Making these investments low-carbon and climate resilient will require a massive scale up of new technologies, goods and services and presents a significant opportunity for Ontario businesses and communities. It is also an opportunity to begin decoupling economic growth from growth in emissions.

Ontario is also planning to invest more than $130 billion in public infrastructure over the next 10 years.[19] These investments will play a major role in shaping the performance of the Ontario economy, its productivity, energy consumption and determining its level of climate risk.

Ontario's economy has changed over the last decade. Sectors such as finance, insurance, real estate, health and education, and public administration have grown. At the same time, Ontario has emerged as the top destination for green investment in North America.[20] All sectors have opportunities in the low-carbon economy, which will require new technologies, advanced manufacturing, insurance and risk expertise, and legal and financial services to support new business models. Ontario will work with all sectors to build a more productive, resilient and competitive low-carbon economy.

The economies of China, India and the European Union are all investing in a low-carbon future. Ontario needs to do the same to fulfill its guiding principles of learning from others and demonstrating leadership. A shift to a low-carbon economy has already begun in Ontario and will require deepening of existing trends in energy conservation and efficiency, through efforts such as Conservation First, as we embark on the long-term transformation of our economy. We will redirect our market forces, our economic supports and signals, our ingenuity and innovation to the task. All individuals, economic sectors and regions will have a role.

Science and Technology

The development of science and technology has been fundamental to the growth of the modern economy. It is also fundamental to the climate change challenge. While we have many technologies today that can help us make great strides towards reducing carbon emissions, reaching carbon neutrality will require new, previously unimagined technological breakthroughs and scientific discoveries.

Low-carbon technologies are those that allow us to move away from conventional uses of fossil fuels to lower, more efficient energy end use. Some examples include increasing low-carbon energy supplies such as solar and wind power, energy storage, and alternative fuels such as biofuels; and, improving efficiency of energy end use such as more efficient appliances, vehicles and buildings. Many of these technologies are in use or are close to commercialization. To achieve carbon neutrality, however, governments and the private sector must invest in basic research to lay the foundations for technological innovations that may be 10-20 years out. Technologies such as thin film solar, solar fuels, carbon capture and storage, air capture and artificial photosynthesis may also prove to be significant in the longer term, but require support in their development.

Ontario has the opportunity and capacity to develop and contribute to technologies of local and global significance. Already, Toronto ranks 1st in North America and 2nd globally for its commitment to the low-carbon economy.[21] We, along with other levels of government, the private sector, researchers, and entrepreneurs, can promote systems of innovation to support the development and deployment of low-carbon and climate resilient technologies. We should be turning to research and the dialogue on innovation to help guide us. The work of Tom Jenkins, Chairman of OpenText Corporation, and of the Canadian Council of Academies' Expert Panel on the Socio-Economic Impacts of Innovation Investments is instructive. Jenkins outlined how Canada can use digital technologies to become innovative thinkers and suggested a range of actions to improve innovation in Canada, including shaking our cultural aversion to risk, establishing communities of practice around innovation, investing in research and development, and having a global outlook.[22] The Canadian Council of Academies, and then President Elizabeth Dowdeswell (now Lieutenant Governor of Ontario), emphasized that Canada is strong in government-led research, but weak when it comes to business investment in innovation. The Canadian Council of Academies has proposed approaches to evaluating Ontario's innovation ecosystem to ensure that investments are targeted and outcomes measured.[23]

Ontario has a strong foundation for technological innovation in many sectors and has an opportunity to further align science, research and development, business supports, and economic signals with global low-carbon priorities. Ontario's Long Term Energy Plan, Feed-in Tariff Program and the phase out of coal-fired electricity have been a key to innovation and technology deployment in the energy sector. For example, with its lead in smart meters, Ontario is creating an energy system that can serve as a laboratory for energy innovation.

Managing Risks and Improving Resilience

As a large and diverse province with a wide variety of landscapes, industries, and people, Ontario will need to prepare for a changing climate in ways that reflect the local and regional vulnerabilities and risks. The costs of inaction are significant. Even though we are acting under great uncertainty in terms of our future climate, recent experience has shown that it is usually less expensive to proactively manage risks than to react with disaster relief and rebuilding efforts.

Ontario's historical data demonstrates significant changes in our temperature and precipitation trends.[24] We are seeing perceptible shifts in seasons – shorter winters with an earlier onset of spring, increasingly intense weather events such as ice-storms, rain storms, and periods of drought and changes to the freeze and thaw cycles— which suggest that our climate has already changed.

Ontario climate change projections for the next 10, 20, 30 years indicate more severe weather (see **box to the right)** with more precipitation interchanging with periods of drought, and generally warmer winters and summers. The Far North is expected to be one of the most rapidly warming regions both in Ontario and on a global scale, posing significant risks to First Nations and Métis and other vulnerable communities.

What will Ontario feel like in 2050s?

If emissions continue to grow at the current rate, various regions of Ontario may experience the following impacts:

- In central Ontario, warmer weather may result in increased variability and some uncertainty about optimal growing areas and conditions for certain crops.
- Increased heat stress will likely affect southern Ontario, as well as the threat of new pests and infections.
- More extreme weather events, including wind, ice and rain, will likely take a toll on our infrastructure, patience and financial resources.
- With the rate of warming in Ontario, winter ice-roads may no longer be viable in the far north, further isolating communities.

Impacts and Risks

With many different geographies and, a wide range of built environments and people, the impacts and risks to Ontario are similarly wide-ranging—to our economy, our biodiversity, our people and property, and our food production and safety.

Climate change is a global phenomenon, but impacts are felt mostly at the local level. Actors in municipalities, local institutions and the private sector are critical to building resilience. Climate change risks depend on vulnerabilities, and thus, managing risks means reducing vulnerabilities.

It will be important to tailor planning decisions to the local vulnerabilities and context and involve those that are facing risks. In New York City, the local planning and decision making process led to the creation of the city's comprehensive resilience blueprint, which measures climate risk across all major

vulnerable areas, from the power grid to hospitals to the coastline. Any local assessment must acknowledge a diversity of experience, knowledge and information. This is especially the case with First Nations and Métis communities in Ontario that have traditional knowledge and distinct experiences we must consider in the next steps of addressing climate change.

Risk Assessment and Planning

Risk mitigation planning can be distilled into five components that must remain flexible to new insights and knowledge around the evolving climate. These components are:

- **Observations** of impacts, as well as an understanding of the availability of data and resources, in each region and community.
- **Assessment of vulnerabilities** in each community based on three factors: the nature of the climate changes to which it is exposed; the climate sensitivity of the system; and, the capacity of that system to adapt to changed climate conditions.
- **Prioritizing risks and developing adaptation plans** based on data availability, benefits, costs, effectiveness, efficiency and feasibility.
- **Implementation,** led and co-ordinated by government with important contributions by affected businesses and individuals.
- **Monitoring and evaluation of initiatives** for the purpose of correcting and adjusting existing initiatives, and for the purpose of incorporating new insights into the next generation of initiatives.

Overall, climate resilience will require innovative approaches and policy models that leverage leadership in businesses, municipalities, communities, and First Nations and Métis communities, and build on an overarching provincial framework. Some organizations are already promoting thinking on adaptation, preparedness and resilience including, for example, the Ontario Climate Consortium, the Engineers of Canada, the Institute for Catastrophic Loss Reductions, the Insurance Bureau of Canada and the Ontario Centre for Climate Impacts and Adaptation Research (OCCIAR).

Well-built Communities

We often think of how we will reduce emissions in electricity, industry, buildings, transportation as discrete problems. We separate discussions of how we will adapt to climate change from how we will reduce emissions. It is in our communities that these pieces come together, interact and influence each other.

Whether we live in an urban, rural, Northern, or First Nations and Métis community, where we live, where we work and how we get there makes up most of our carbon footprint. Many of our daily patterns are influenced by the planning and design of our communities and the choices that these present. Smart design can help us move towards "carbon neutral communities" and reduce emissions. It can also improve climate resilience and boost our economic productivity and quality of life.

Urban Areas

Our urban areas are growing. Over 85 per cent of people in Ontario live in urban and suburban areas.[25] Ontario's largest urban region, the Greater Golden Horseshoe – which also includes some of Canada's significant ecologic and hydrologic natural environments and scenic landscapes, including the Oak Ridges Moraine and the Niagara Escarpment, is expected to grow by 50 per cent by 2041.[26] We must accommodate this growth in communities in a way that stabilizes greenhouse gas emissions in the near term, supports substantial reductions over the medium term and prepares our communities for the worsening impacts of climate change. There are many examples emerging all over the world of climate-friendly communities and well-built sustainable urban design that help to stabilize greenhouse gas emissions. These

communities have a smaller urban footprint and focus on reducing greenhouse gas emissions by allowing people to live work and shop in the same area. They allow for more walking and cycling. They include energy efficient building designs, integrated local renewable energy, and take advantage of urban density to "borrow, balance and steal" among energy, water and waste systems. Reusing water also reduces the energy required to treat and distribute water by municipalities. For example, municipal water and wastewater services typically are one-third to one-half of a municipality's total electrical use – double that of street lighting.[27] Climate friendly communities also ensure that natural areas that absorb carbon dioxide from the atmosphere and help to offset urban emissions are protected for future generations.

In existing developed areas, there are opportunities to retrofit and repurpose existing buildings, waste less and use new materials, and find new uses for abandoned or underutilized lands. Green designs such as green roofs, efficient buildings, permeable paving and incorporating green and blue (water) landscaping in design features can help address heat island impacts in cities, cool the local climate and reduce energy use and associated GHG emissions. Canals and swales in the city scape can also help manage the risk of flooding.

Rural Areas

Rural areas in Ontario include settlement areas (towns, villages and hamlets), agricultural lands, areas of natural heritage and other resource areas. Rural communities make a valuable contribution to the province's economy and our quality of life; rural areas and urban areas are interdependent in terms of markets, resources and amenities. However, due to larger geographical land base and lower average incomes than urban areas, rural communities experience more challenges in delivering services and supporting infrastructure for their communities. Each region is unique based on differing demographic, employment opportunities, natural heritage systems and varying capacity to provide services essential for growth. This diversity is a significant contributor to why more than 1.8 million Ontarians call rural Ontario their home.

Successful growth in the rural areas of the province helps to enrich our cultural fabric while creating opportunities for economic development. It is important to leverage rural assets and amenities and protect the environment as a foundation for a sustainable economy. As stewards of many of the province's natural systems, rural communities are vulnerable to a wide range of climate impacts. Similar to urban areas, rural communities can accommodate growth in ways that minimize greenhouse gas emissions and protect these natural systems while allowing for their economies to evolve and grow. Infrastructure design and implementation that supports climate change objectives while enabling a reduction in climate change impacts can assist with some of this. Rural areas can also have an important role in the removal and storage of carbon dioxide from the atmosphere in forests, wetlands and soils. The shift to a low-carbon economy will create challenges for rural communities but also opportunities to supply renewable energy, as agricultural and forestry outputs are increasingly seen as feedstock for production of fuels and advanced bio-materials that can replace those derived from fossil fuels.

Northern and Remote Areas

Northern Ontario covers 90 per cent of the province and 6 per cent of the province's population. Within the North, the Far North is home to 24,000 people living in 34 communities. First Nations people make up more than 90 per cent of the region's population and live mainly in remote, fly-in/winter road access only communities. These communities are deeply connected – economically, physically, socially and culturally – to the natural world. Populations in the Far North can be more vulnerable to climate change

because change is happening more rapidly in the region, and also due to limited resources to adapt and challenging economic conditions in some communities. For example, 31 of the 34 communities with an approximate total population of 21,000 are dependent on 3,183 kilometres of winter roads. Winter roads are vital arteries for supplying critical services, food and goods to remote areas. Winter road seasons have decreased in recent years, a trend that is expected to continue and will have dramatic effects on the cost and quality of life for many Northern communities.

The Far North also represents a significant area of natural carbon storage. Ontario's Far North, including the Boreal Forest and peat lands, is one of the last, great, undeveloped spaces on the planet and a vital carbon sink. We need to ensure that we protect these natural heritage areas, not only for their beauty and biodiversity, but also because these vital sinks could become sources of emissions of carbon if they are disturbed or removed.

While addressing climate change is an enormous task, the strengths and perspectives of all communities in Ontario is critical to our efforts to find solutions and manage the risks of climate change.

First Nations and Métis Communities

First Nations and Métis communities – in the North and across Ontario– are particularly vulnerable to climate change. It is anticipated that some communities will experience significant impacts of climate change as a result of the natural environment changing.
The locations and economic situations of First Nations and Métis communities may make them particularly vulnerable to changes in climate and weather impacts. Many of these communities depend on the natural environment for subsistence, the maintenance of their culture and other important aspects of their livelihoods. For some communities, their remote geographic location will increase the magnitude of climate change impacts at the community level. Current challenges such as reliable infrastructure and transportation corridors, and access to clean drinking water can be exacerbated by climate change.

SECTION 3

Short-term Need: Climate Critical Actions

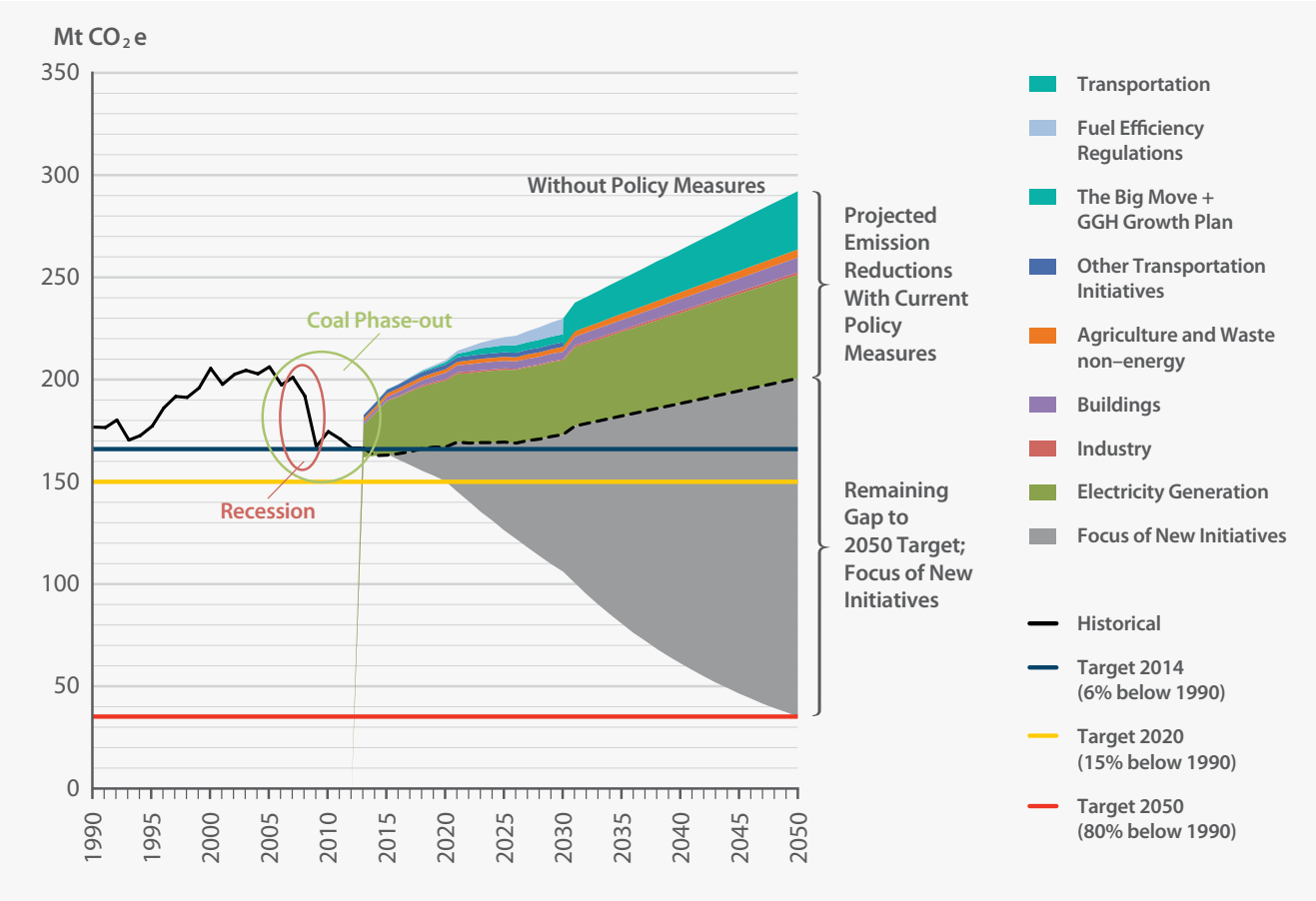
Meeting Ontario's short-term emission reductions targets with practical and effective strategies and actions.

Short-term Climate Critical Action

We have established that addressing climate change is a long-term transformative challenge. To meet Ontario's targets – 15 per cent emissions reduction from 1990 levels by 2020 and 80 per cent emissions reduction from 1990 levels by 2050 – we must begin with practical actions and build on what we have started.

Figure 1 shows that in the absence of new actions, we expect emissions to begin to rise again as our economy and population grow. The illustrative wedges emphasise the importance of taking action early as delays take us further from our targets.

FIGURE 1 Ontario's GHG emissions trajectory "wedges"[28]



Climate Critical Policies

Climate-critical policy areas are those that are essential to help drive action in key sectors of Ontario's economy, help us achieve our greenhouse gas emission targets, and accelerate the transformation to a low-carbon society. Designating 'climate-critical' policies also allows us to formalize the inclusion of climate change considerations in government decision-making.

We have identified four climate critical-policy areas to help us toward our short term 2020 target and to lay the groundwork for the transformative changes that need to happen across society by the second half of the century. While each category is discussed separately, linkages are also identified. For instance carbon pricing can support technology development and drive conservation measures.

1. **Price on Carbon –** There is a growing global consensus in favour of carbon pricing that is reflected by the approaches being taken by national and, increasingly, subnational governments world-wide. It is critical to send the right signal to Ontario's economy, to motivate emission reductions and innovation.
2. **Take Actions in Key Sectors –** strengthen conservation and improve efficiency trends, including through implementing the government's Conservation First policy, and productivity in transportation, industry, buildings, electricity, agriculture, waste by building on existing climate-critical provincial initiatives.
3. **Support science, research, and technology –** as driver of economic growth and a critical piece of long term transformation.
4. **Promote climate resilience and risk management in key areas and with key partners –** on issues including stormwater management.

Price on Carbon

Putting a price on carbon assigns economic value to our atmosphere and environment. A well-designed carbon pricing system is the most cost-effective approach to reducing greenhouse gas emissions. Carbon pricing reduces greenhouse gas emissions as businesses and households incorporate the cost of emitting carbon into their decisions, encouraging companies and consumers to move away from fossil fuels and towards cleaner and more efficient ways of going about their business. Emitters will reduce emissions when doing so is cheaper than paying the carbon price and, depending on the scope of the program, these incentives can extend across all sectors of the economy.

As emitters are motivated to lower their carbon footprint, carbon pricing can spur clean technology research and development as well as growth in the clean technology sector. This is supported by recent economic studies that show the overall economy-wide impact of carbon pricing in many jurisdictions is either neutral or small.[29]

A clear advantage offered by carbon pricing is that it gives companies the flexibility to reduce emissions in a way that best suits their manufacturing processes and business plans, as opposed to more traditional approaches to regulation which dictate either the amount to be reduced or the technology to be used. There are two main approaches to carbon pricing: emissions trading and taxes. Both send a clear market signal to emitters and consumers about the need to reduce emissions. The box below outlines the different types of approaches. Emissions trading-based approaches can encourage broader reductions by providing a financial benefit to entities that can achieve emissions reductions at lower cost. In the absence of a global carbon-pricing mechanism, many national and regional approaches have emerged.

What are the various approaches to carbon pricing?

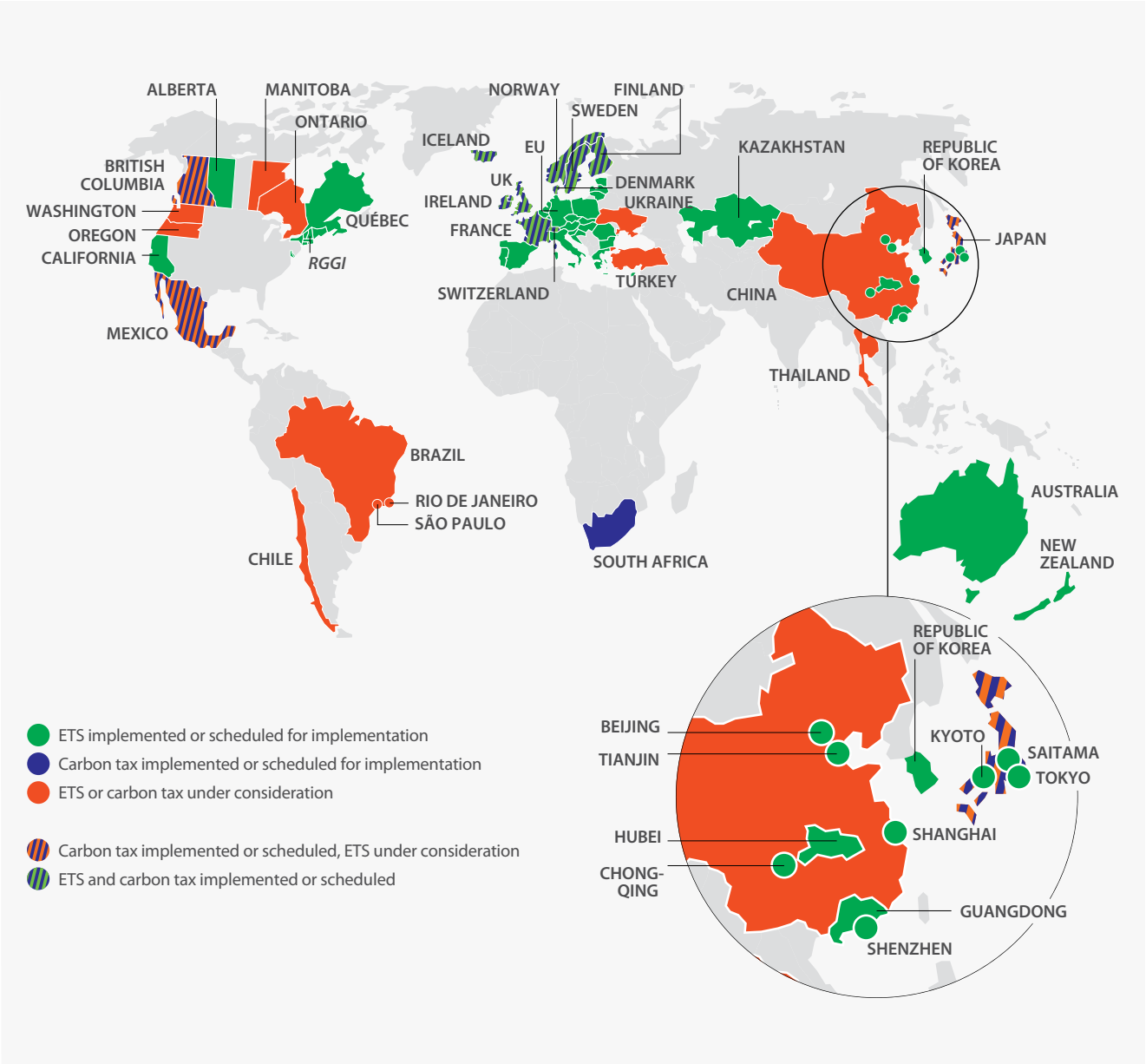
A **cap and trade** program places a limit on total emissions, with the price being determined in the market. With this approach, a limit or cap is set on the amount of greenhouse gases that can be emitted in a given period. The cap is divided up into permits. Some permits can be distributed free of charge to certain emitters in order to address competitiveness issues. The remaining permits can be auctioned. Emitters must acquire enough permits to match their emissions. Emitters that have reduced emissions can sell extra permits to emitters who need more. The auction and trading of permits establishes the carbon price which can fluctuate over time, depending on demand. Trading helps ensure the overall emission reduction occurs at the lowest cost. Auction proceeds are usually used to support greenhouse gas reduction technology and projects.

A **baseline and credit** system is an emission trading approach aimed at improving the greenhouse gas intensity of production while not limiting the total amount of greenhouse gas emitted. A baseline intensity is determined for each emitter, which is then required to improve its efficiency by a set amount (e.g., a 10 per cent reduction in the average amount of greenhouse gas emitted per barrel of oil). Emitters that overachieve can obtain credits that can be sold to other businesses that exceeded their limits.

A **carbon tax** sets the price, allowing reductions to vary. With this approach, a charge is applied to each tonne of greenhouse gas emitted. It is often applied widely across the economy to all fuels, often at the point of sale (for example, at the gas pump for gasoline). There is no limit or cap on emissions.

Regulations and performance standards require businesses to meet standards or specific targets or to use specific technology. This approach requires the regulator to have sufficient and specific information to set appropriate requirements. Market-based approaches like cap and trade can help emitters meet standards with increased flexibility and lower costs.[30]

FIGURE 2 Carbon Pricing Systems [31] (ETS = Emissions Trading System)



Many jurisdictions in North America and beyond have already moved or are moving towards some form of greenhouse gas emissions reduction program. Ontario has been consulting on reducing greenhouse gases through a cap and trade program since 2008, when, along with Quebec, Ontario joined California and other states in the Western Climate Initiative. Ontario collaborated with California and Quebec to develop the model rule that now forms the basis of their joint trading program. As of May 2014, 39 national and 23 sub-national jurisdictions were implementing or were scheduled to implement carbon pricing, and another 27 jurisdictions were considering carbon pricing.[32] Notable examples include some of Ontario's closest neighbours and key competitors in the global economy:

- **Quebec –** established a cap-and-trade program in 2013 and linked with California in 2014. The program currently applies to large electricity generators and industrial facilities, and expanded in 2015 to include transportation and heating fuels.
- **Alberta –** established a baseline and credit system for large industry and electricity in 2007. Emitters also have the option of buying offsets or paying $15 per tonne for emissions in excess of their emissions targets into a fund in lieu of making reductions. The fund is used to support research and development, and demonstration of new approaches to reducing greenhouse gas emissions.
- **British Columbia –** introduced a carbon tax at $10 per tonne of carbon dioxide in 2008, rising in five-dollar increments annually to reach a maximum of $30 per tonne since 2012. The tax covers fuels used for transportation (road, rail, marine and air), heating, and industrial processes, and is revenue-neutral. BC also introduced new legislation in October 2014 to establish a baseline and credit system for liquefied natural gas (LNG) facilities. LNG facilities can use offsets or contribute $25 per tonne to a fund to reach the benchmark.
- The **Regional Greenhouse Gas Initiative** (RGGI) is a cap-and-trade program established in 2009 in the northeastern US states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont) that applies to the power sector. Since being in place, emissions have reduced by 18 per cent, significantly more than what was required by the cap. Electricity rates declined by 8 per cent across the region while rates in non-RGGI states increased by 6 per cent. Moving forward, the program is expected to generate an additional $4 billion in revenue, $8.7 billion in economic growth and 132,000 job years of employment by 2040.[33]
- The **European Union's emissions trading system,** in place since 2005, is the largest multi-national cap-and-trade system and covers more than 11,000 power stations and manufacturing plants, as well as airplanes flying within and between most EU countries. Studies from the years prior to Europe's economic downturn attribute 40-80 million tonnes per year in emission reductions to the program. This is equivalent to 2-4 per cent of total capped emissions which is much more than the impact of most other individual energy-environmental policy instruments. Studies examining the immediate years following the downturn conclude that the program led to some small levels of abatement despite concerns over prices.[34]
- **China,** the largest global emitter, implemented its seventh pilot emissions trading program in June 2014 and is preparing to start a national program between 2016 and 2020 which would be the largest system in the world, covering close to four billion tonnes of annual emissions.
- The **United States** recently proposed the Clean Power Plan which would establish state-by-state reduction targets for electricity generation and is expected to stimulate interest in new regional trading programs and expansion of existing programs such as the RGGI Initiative for the electricity sector.

Ten companies with operations in Ontario are already covered under Quebec's program,[35] and many other companies have familiarity through their global operations and have recognized the need for a low-carbon future. In 2013, over 100 companies worldwide publicly disclosed to the Carbon Disclosure Project[36] that they already use carbon pricing as a tool to manage the risks and opportunities to their current operations and future profitability.

It is clear that carbon pricing is a climate-critical policy that will be driving emission reductions across Ontario's economy.

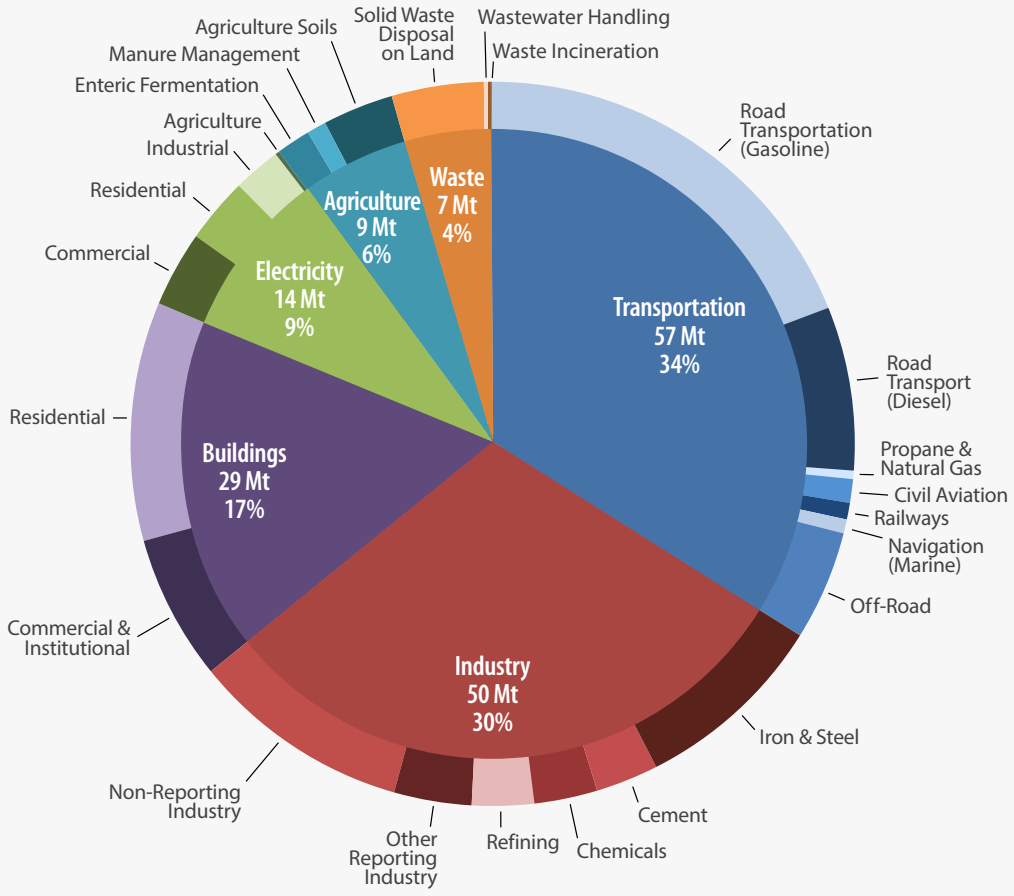
Actions in Key Sectors to Support Transformation to a Low Carbon Resilient Economy

A low-carbon, resilient economy is one that pollutes less, wastes less and makes more efficient and productive use of energy, waste and resources. It's also an economy that is built on climate resilient infrastructure, institutions, and natural systems that can absorb and adapt to the stresses of a rapidly changing climate. Complementary, sector-specific actions and technology innovation are critical along with carbon pricing to achieve greenhouse gas targets.

Figure 3[37] shows the sectors responsible for greenhouse gas emissions in Ontario. Ontario's 2012 GHG emissions are estimated to be 167 Mt. The transportation sector had the largest share of emissions, followed by the industrial and buildings sectors.

Figure 3 focuses the mind on how to change current behaviours. It is important to note that this pie chart only captures emissions and does not reflect the important role and value of carbon sinks in removing carbon from the atmosphere, for example in the forestry and agricultural sectors.

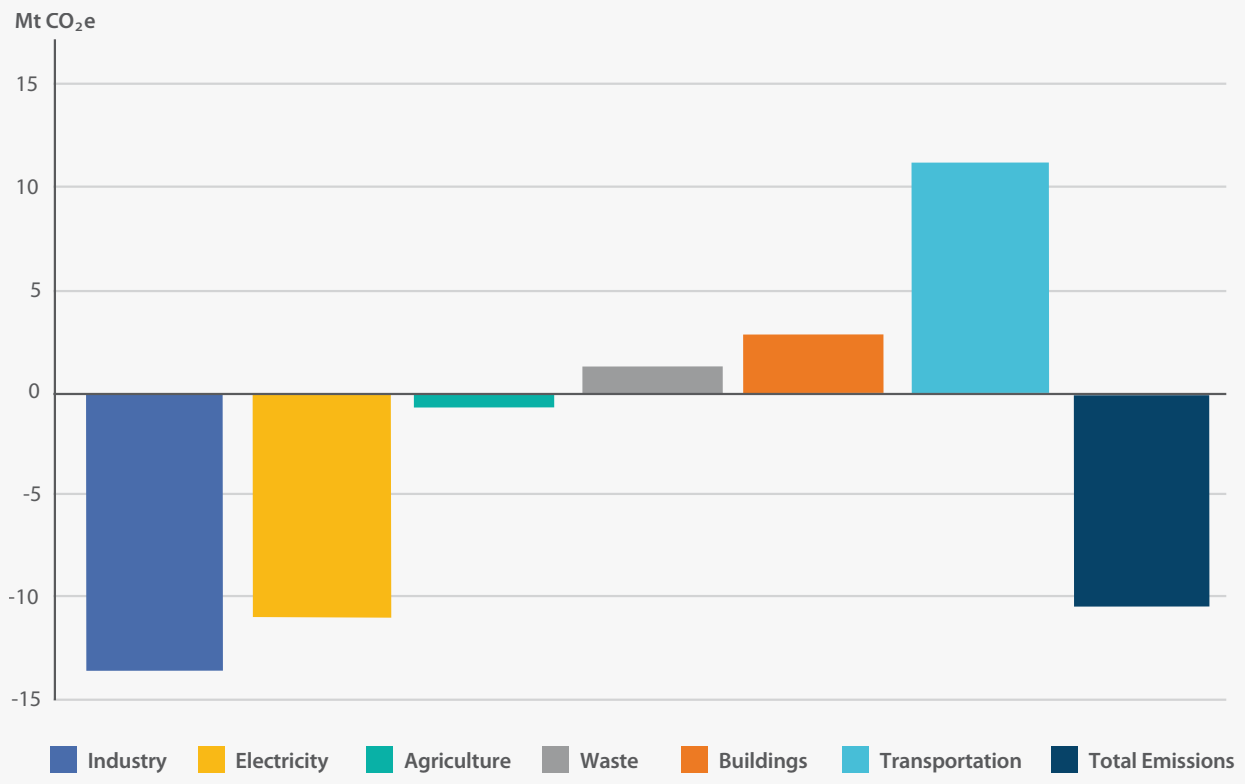
FIGURE 3 Ontario's 2012 Greenhouse Gas Emissions by Sector



Source: National Inventory Report 2014 (2012 data), Ontario's Long-Term Energy Plan and Greenhouse Gas Emission Report regulation (O.Reg 452.09) data

Figure 4 shows that since 1990, industry and electricity emissions have declined, due to the phase out of coal-fired electricity, improved energy efficiency and the shifting composition of Ontario's industrial base.[38] Emissions from buildings and transportation have increased due to population and economic growth, to the point where together they account for over half of Ontario's total emissions. Reducing emissions requires actions across sectors, as discussed below.

FIGURE 4 Changes in Ontario Emissions by Sector 1990-2012



Source: Ontario's Climate Change Update (2014)

Transportation

Ontarians need price competitive options in transportation, from better public transit, to more efficient and low-carbon vehicles and the opportunity to make more trips by walking and cycling. Reducing emissions from the transportation sector requires further expansion of existing actions in three key areas:

- **Low-carbon mobility:** Implementing infrastructure and planning improvements to provide viable travel choices for Ontarians, such as active transportation and increased transit use to reduce overall vehicle use and achieve greater overall transportation system efficiency. For example, the Big Move and continued investments in transportation and transit infrastructure will help improve the efficiency and sustainability of transportation networks within the Greater Toronto and Hamilton Area and across Ontario. Improved land use planning will reduce distances between homes, workplaces, recreation areas and commercial districts. The Regional Express Rail and other improvements in transit service will increase ridership on transit powered by clean electricity and help move us toward a lower emissions transportation sector.
- **Vehicles:** As the world moves towards zero emissions by the second half of the century, the vehicles we use will also need to shift towards zero emissions, which will require significant efforts in technological innovation. Much of this innovation is happening as we make lower weight and fuel efficient vehicles and increase provision of alternative fuel vehicle infrastructure. Efforts like the California-Quebec Working Group on Electric Vehicles will encourage collaboration on electric vehicles.
- **Fuel:** Increasing the provision and use of alternative transportation fuels, based on low/no carbon energy.

Buildings & Communities

Reducing emissions from these sectors requires leveraging existing initiatives and further action in three key areas:

- **Land Use and Infrastructure Planning:** Curbing urban sprawl and creating complete communities that are healthy, walkable and supportive of transit and active transportation, while protecting valuable agricultural lands, natural resources and the environment. The Big Move and Ontario's Coordinated Review of the Growth Plan for the Greater Golden Horseshoe, the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan and the Niagara Escarpment Plan present an opportunity to consider climate objectives in provincial land use plans. Consultations for the co-ordinated review will start in early 2015 and will be ongoing in parallel to consultations for this renewed climate change strategy.
- **Existing Infrastructure:** Scaling up investments in energy conservation upgrades and retrofits for existing buildings for example through incentives and innovative finance.
- **New Infrastructure:** New buildings that are even more energy efficient, harness renewable energy, and use integrated energy infrastructure (e.g., district energy) for greater efficiency and introduce infrastructure to support the adoption of alternative fuel vehicles.

Electricity

Ontario has already taken significant action to reduce emissions from the electricity sector and this sector already reduced emissions by more than 66 per cent between 2000 and 2012. Ontario successfully eliminated coal as a source of electricity generation in April 2014 – as a result, the estimated emissions for the sector are expected to be 5.4 Mt in 2014. Identification of technology pathways that can help this sector

achieve further reductions in emissions, and eventually carbon neutrality, are needed. Greater access to information on energy use through platforms such as OpenData can assist people to make better energy and resource choices. Instruments such as local improvement charges, for example, may help municipalities finance energy efficiency improvements on private properties, reducing emissions from existing homes. Through its Long-Term Energy Plan and Conservation First policy, Ontario recently established very aggressive electricity and natural gas conservation objectives which aim to achieve all cost-effective conservation in the province. The new Conservation First framework for electricity conservation includes a conservation target of 7 TWh in 2032.

Industry

As previously stated, Ontario's economy has undergone major restructuring over the past decade. The biggest change has been the relative decline of output and employment in the manufacturing sector, which is reflected in the emissions trends in **Figure 4.** This transformation has also taken place in other advanced economies as production in certain industries shifts to low-cost jurisdictions, a trend that accelerated during the global recession.[39]

The clean tech, low-carbon economy is a significant opportunity for Ontario's industrial and manufacturing sector. The technologies and products in the new energy economy will require the advanced manufacturing, technologies and skilled workers, which already form the backbone of Ontario's manufacturing sector. We will need more investment in these strengths to compete in the global marketplace.

It will be important to position industry to improve productivity and competitiveness by using resources more efficiently and investing in research and development. Reducing emissions from the industrial sector requires a combination of fuel-switching (e.g. to electricity or biomass), supported by strategic investments that allow energy-intensive activities to reduce emissions through adoption of new energy-efficient technologies (e.g. combined heat and power as well as enhanced combustion technologies), low-carbon inputs and onsite renewable energy production. Low-carbon products produced by industry can be used in other sectors (e.g. transportation, building construction).

Agriculture & Forestry

Agriculture and Forestry are unique in that they emit greenhouse gases through their fuel use and transportation and they also influence the removal and storage of carbon from the atmosphere in soils and vegetation. They also supply bio-based feedstocks, which are replacing higher carbon feedstocks (e.g. petroleum) for transportation fuels and other products, thereby recycling the carbon rather than just releasing the stored carbon. Farmers can manage nitrous oxide (another greenhouse gas) emissions through improved fertilizer use, and increased soil carbon and soil health through best practices, including adoption of different crop types, crop rotations, cover crops, modified tillage, and residue and manure management. While we try to increase the carbon content of soils, it will be also very important to ensure Ontario has clean and healthy soils. Forest management approaches can also enhance carbon sequestration.

Waste

Emissions from the waste sector are generated by the degradation of organic waste disposed in landfills and to a lesser extent through wastewater treatment. Ontario and many other jurisdictions have regulations requiring landfill gas collection and destruction or use (e.g., use of combustion turbines to produce electricity). Reducing emissions from landfill in the future will require greater diversion of organic wastes. Reducing, reusing and recycling non-organic wastes are also critical to reducing our carbon footprint.

Science and Technology Pathways

Reaching carbon neutrality will require technological breakthroughs and scientific discoveries that require a long-term planning horizon to fully realize the potential these breakthroughs can have. In the short-term, it is important to plant the right seeds to show the market that innovation and technological breakthroughs are valued in the Ontario marketplace. Science and technology will also help bring down the costs of existing technologies. Ontario has the opportunity and capacity to develop and contribute to technologies of global significance. We, along with other levels of government, the private sector, and academia, can promote systems of innovation to support development and deployment of low-carbon technologies. Science and technology innovation require a wide range of networks, supports and signals. Examples include strong research institutions, angel and venture capital investors, demonstrations and market signals such as a carbon price. Ontario has an opportunity to align its innovation agenda and supports with the emerging global low-carbon transformation, especially in areas where Ontario may have competitive advantages or strategic interests. Ontario firms also need to invest in innovation and unlock the venture capital to stimulate the development and uptake of new technologies.

Promote climate resilience and risk management with key partners

Weather vulnerability is already visible in our province and having an economic impact. Experiences are showing that even though we are acting under great uncertainty when it comes to the special conditions of our future climate, it is usually less expensive to proactively manage risks than to react with disaster relief and rebuilding efforts. Some organizations have already started to organize multi-stakeholder dialogues around creating resilience including for example the Public Infrastructure Engineering Vulnerability Committee (PIEVC) tool from Engineers Canada as well as the Institute for Catastrophic Loss Reduction. Ontario is planning to invest more than $130 billion in public infrastructure in the next 10 years. These investments will play a major role in shaping the performance of the Ontario economy, its productivity, energy consumption and determining its level of climate risk.

Ontario will integrate climate change adaptation and resilience considerations in key infrastructure and asset planning decisions by applying an 'adaptation lens' (consideration of vulnerabilities, risk and corresponding resilience to climate impact) to all funding and infrastructure processes. For example, vulnerability, risk impacts and resilience to climatic changes including extreme weather will be integrated into Ontario's Long-Term Infrastructure Plan (LTIP).

SECTION 4

Summary and Discussion Questions

We want to hear from you – your thoughts, questions and suggestions.

Summary and Discussion Questions

The climate change discussion document presents considerations for Ontario's approach to addressing climate change over the short and long term. There are various tools at our disposal including carbon pricing and climate critical policy areas. It will be important to determine which initiatives and programs currently underway are the most effective in reducing emissions and building resilience in order for Ontario to meet its emissions targets and adaptation goals.

Addressing climate change requires input and involvement from all sectors and all Ontarians. In order to pursue and shape the best long-term path for Ontario while ensuring that the right short term priorities are chosen, the province plans to consult with the public, stakeholders, businesses, First Nations and Métis communities, and municipalities to gather feedback on this proposed approach to climate change. Every Ontarian has a role to play. We look forward to hearing your thoughts, ideas, solutions and success stories.

This document will be posted to the Environmental Bill of Rights for a 45 day comment period. During and after that time, focused discussions, town halls meetings and stakeholder forums will be organized to ensure that the themes and approach are considered from a number of stakeholder perspectives.

Following consultations, Ontario will prepare a long-term climate change strategy and develop a 5-year action plan for release.

You should consider and provide your perspective to the following questions. The questions are organized along five themes:

- **Traditional Knowledge**
- **Actions in Key Sectors**
- **Price on Carbon**
- **Communities and Built Form**
- **Science and Technology**

The questions are general in nature and intended to prompt discussion on the broad societal challenge of climate change and they do not necessarily reflect the policy direction of the government of Ontario.

Discussion Questions

1. **Traditional Knowledge**

- What are the best ways to employ the traditional knowledge of First Nations and Métis communities in the process of developing the climate change strategy and action plan, and in implementing their provisions?

2. **Actions in Key Sectors**

- What can each of the key sectors, including transportation, industry, buildings, electricity, agriculture, waste and forestry, do to contribute to Ontario's 2020 and 2050 targets?
- What can government better do to encourage industry to further increase rates of innovation that would lead to improved productivity of all capital, including natural capital, in order to reduce emissions?
- What Industry sectors may best be able to achieve voluntary emissions reductions by 2020 and by 2050 sufficient to achieve Ontario's emissions targets?
- What role can the agricultural and forestry sectors play in reducing emissions and/or providing carbon sinks or offsets?
- What role should land use planning have in affecting Ontario's boreal carbon storage?
- Climate change will have an impact on Ontario's food supply. What role should this issue play in Ontario's climate strategy?
- How can Ontario best achieve reductions in emissions in the transportation sector sufficient to achieve Ontario's targets?
- What are the barriers to uptake in low-emission, zero-emission, and electric vehicle use in Ontario?

3. **Communities & Built Form**

- Transportation emissions have grown at a rate faster than any other class of emissions largely because of population growth and urban expansion. What role could the Growth Plan for the Greater Golden Horseshoe and other planning mechanisms play, in combination with other government initiatives such as electrified Regional Express Rail, in stabilizing the growth in transportation and building emissions?
- Building net zero communities and buildings are already possible from an engineering standpoint yet few have been constructed. In Ontario, what changes are needed to building codes and planning processes to ensure greater uptake with regard to geothermal, solar, wind, natural light, combined heat and power, community energy and other emerging technologies?
- Buildings must be operated as efficiently as possible – if not operated properly, "green" buildings cannot achieve their sustainability objectives. Does Ontario have the skill base to build and operate such buildings and communities and, if not, what more can be done to train the appropriate expertise?
- When including emissions from electrical demand and heating gas, buildings in Ontario already account for about 1/4 of our emissions. How could emissions from the existing building stock be reduced sufficiently to ensure Ontario achieves its targets?
- What more could be done to ensure more Ontarians have the capacity to invest in low-carbon buildings and technologies?
- Risk assessment will be critical in the design and rehabilitation of infrastructure. How can Ontario communities best determine their local vulnerabilities and risks, engaging local leaders in government, First Nations and Métis communities, and the private sector?

4. **Price on Carbon**

- This spring Ontario will confirm the market mechanism or mechanisms that will be used to price carbon in Ontario. Some of the goals of carbon pricing include:
  - ensuring greenhouse gas emissions *reduction certainty;*
  - supporting and encouraging *innovation* in industry;
  - improving human, social, financial, produced and natural capital *productivity;* and to
  - supporting households and business *transition* to the low carbon economy.
- Given the above, what market mechanism or mechanisms will best achieve these goals for Ontario?
- For those industries already facing challenges today due to changing economic conditions or technological advances in other jurisdictions, what carbon pricing market mechanism or mechanisms would be most beneficial? What design considerations should be taken into account?

5. **Science & Technology**

- In what areas of low-carbon science and technology does Ontario have competitive advantages or strategic interests?
- How can Ontario better support early stage research that could lead to the future commercialization of technologies that will provide economic benefits while also helping Ontario achieve its carbon reduction goals?

SECTION 5

End Notes

End Notes

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