Executive Summary

On October 5, 2016, the Paris Agreement, agreed to at the twenty-first session of the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), cleared the final hurdle with 55 countries — representing 55 percent of global emissions — ratifying their commitment. Canada's Parliament voted to support the climate change agreement following Cabinet's decision to ratify the accord. On November 4, the Paris Agreement came into force and on December 9, all but two Canadian provinces signed onto the Pan-Canadian Framework on Clean Growth and Climate Change as the plan to meet Canada's commitment to a 30 percent reduction in greenhouse gas (GHG) emissions from 2005 levels by 2030.

The Paris Agreement heralded a new level of engagement on energy innovation with COP21's "Mission Innovation" — a commitment, by 21 member countries, to doubling the investment in energy innovation by 2020. Public investment in innovations related to energy and to carbon and business environment enablers that reduce barriers to the emergence of new firms have resulted in the creation of many firms whose business models are founded on innovation and whose markets are global, but whose customers and competitors are much larger incumbents.

At the same time, economic researchers such as Thomas Piketty (2014) have concluded that economies and industries are both increasingly concentrated, with fewer and fewer firms representing a greater share of economic activity. In Canada, the concentration of industries appears to be associated with low levels of investment in innovation and, consequently, low productivity. This low innovation equilibrium creates structural impediments to the growth of new firms. For example, emerging innovative firms with solutions to reduce CO_2 emissions are not consulted in standard setting, environmental regulation and approval processes, whether domestically or in multilateral processes such as the UNFCCC. The private sector roles in these processes are dominated by large incumbents. Such structural barriers reduce the rate at which innovations are considered in regulatory formulation and, as such, will slow progress toward both growth goals and Paris Agreement goals.

Innovation policy makers must consider how public investments in innovation are translated into markets with ensuing spillover benefits to the environment and the economy. Within the policy framework of stringency, predictability, flexibility and subsidiarity, policies to safeguard the spillover benefits of publicly funded innovation should address market failures and asymmetries in the status of innovative firms vis-à-vis regulators and standards agencies, as well as public and private sector markets. Policies to finance these safeguards should be financed through the prompt unwinding of fossil fuel subsidies embedded in both fiscal policies and public finance.

Four interrelated policies are proposed as solutions to the challenges of stimulating low-carbon growth through the scale-up of new firms where decoupling economic growth from GHG emissions growth is the policy goal: the Innovative Carbon Emissions Mitigation Fund; the Sustainable Finance Performance Warranty Program; the Best Global Regulations for Low-carbon Economy Program and the Sustainable Infrastructure Program.

The Paris Agreement: Translating Commitments into Plans

The Paris Agreement commits its 197 signatories to keep global warming "well below" 2°C above pre-industrial levels. On November 4, 2016, the Paris Agreement went into force, 30 days after the country-level ratification by 55 signatories representing 55 percent of global emissions. The process of ratification was thrust into the spotlight by the joint announcement of US President Barack Obama and Chinese President Xi Jinping on September 3, 2016, in the presence of UN Secretary-General Ban Ki-moon. President Obama spoke of the United States', and China's ratifications as leading by example and President Xi committed China to unwaveringly pursuing sustainable development. President-elect Donald Trump campaigned with the promise to rescind the United States' ratification of the Paris Agreement. Bearing in mind the likelihood of future US actions under the Trump presidency,

as of December 12, 2016, 117 of the 197 parties that signed have ratified their adherence to the treaty, including all 10 of the largest global emitters.

Under the Paris Agreement, Canada committed to reducing annual CO_2 emissions to 524 megatonnes (Mt) by 2030. This represents a 30 percent reduction from 2005 levels. As of 2014, Canada's predicted emissions for 2030 are 291 Mt *in excess* of the 2030 Paris Agreement target. On its current trajectory, Canada will miss its 2030 target by 55 percent.[1] The goal of the Pan-Canadian Framework on Clean Growth and Climate Change, agreed to on December 9 by all but two Canadian provinces, is to reverse this trend and establish a plan for Canada to achieve its Paris Agreement commitment.

Nine months earlier, on March 3, 2016, Canadian federal and provincial leaders met to begin the process of translating Canada's Paris Agreement commitments into plans. In the Vancouver Declaration, they agreed to an approach that balanced federal and provincial jurisdictions. The framework planning process took the form of formal federal-provincial/territorial consultations structured under four working groups: Carbon Pricing Mechanisms; Specific Mitigation Opportunities; Adaptation and Climate Resilience; and Clean Technology Innovation and Jobs.

This last working group, Clean Technology Innovation and Jobs, provided a report with options on how to stimulate economic growth, create jobs and drive innovation across all sectors to transition to a low-carbon economy, leveraging regional strengths. The plan for this working group was delivered to ministers of innovation and economic development.

Based on a cohort of 800 innovative firms in the clean technology sector, roughly two-thirds of Canada's clean technology firms could be viewed as "climate-tech," that is to say, the solutions they provide are part of reducing the use of fossil fuels through:

- alternative forms of energy for electricity, heating and transportation;
- energy efficiency;
- high-performance materials as enablers of low carbon solutions; and
- conversion of carbon into value-added products.

These clean technology companies, which include both privately held and publicly listed firms, were founded to both deliver investor and lender returns, and address climate change.

Many climate-tech firms have been in operation for 10 or more years and are ready to scale up. However, as described below, safeguarding these investments in clean innovation is not a given. Where markets do exist, the price of fossil fuels — which innovations compete against for markets and capital — is volatile and in the future may be subject to downward pressure, making it difficult for low-carbon solutions to be taken up in the market. Negative carbon prices in the form of fiscal and public finance subsidies to fossil fuel industries make market entry even more challenging.

As countries translate Paris Agreement commitments into domestic regulations, more than 40 jurisdictions have implemented carbon-pricing mechanisms, and many are implementing complementary regulations targeting methane and other emissions from coal-fired electricity plants. New research, however, points to deep gaps between climate policy, innovation policy and economic policy. Aligning these through market mechanisms specifically targeted to innovation can help lay the foundation to scale up new firms that provide solutions to climate change, while creating employment opportunities that can replace the jobs that are core to economies today as the transition is made to the low-carbon economy.

Illustration: The Case of MemPore Corporation

On October 3, 2016, the federal government announced Canada's Pan-Canadian Pricing on Carbon Pollution, which stipulated a minimum price on carbon for all jurisdictions starting at $10 in 2018 and rising to $50 in 2022.[2] This important step in Canada's climate policy has taken years of patient work at various levels of jurisdiction. So it is with innovative firms that provide solutions to climate change. These firms are often the product of decades of public

1 See www.ec.gc.ca/indicateurs-indicators/defaultasp?lang=en&n=CCED3397-1.

2 Unless otherwise noted, all figures are in Canadian dollars.