



# ■ Canada's Future as a Global Leader in Technology

**Goodmans<sup>LLP</sup>**

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Richard Corley

## ■ Introduction

Canada has an established presence in the global technology sector and is emerging as a global leader in this sector.

Goodmans LLP was inspired to draft this report in connection with its role as a Founding Member of SingularityU Canada – a community of leaders collaborating to leverage exponential technologies to resolve pressing global challenges. SingularityU Canada hosted its inaugural SingularityU Canada Summit in Toronto in October, 2017.

### **This report has two sections:**

Section 1 outlines factors supporting Canada's emergence as a global leader in the technology sector.

Section 2 explores examples of high-potential Canadian technology industries.

## Executive Summary

### Section 1: Factors supporting Canada's emergence as a global leader in the technology sector

**Canada's Growing, Young, and Highly Educated Population** – Canada's working age population is younger than that of any other G7 country, a higher percentage of Canadians have post-secondary education than citizens in any other country, and Canada's immigration programs target the young, educated demographic.

**Established Technology Sector** – Canada already boasts an established technology sector, which is directly responsible for generating more than \$117 billion of Canada's economic output, and is home to offices of technology firms both homegrown (e.g., Shopify, Hootsuite, and 500px) and international (e.g., Microsoft, Google, Amazon and Uber).

**Regulations Supporting Innovation** – Progressive regulation of autonomous vehicles, equity crowdfunding, immigration and net neutrality, among other areas, support cutting-edge technologies and the growth of Canada's technology sector.

**Ease of Raising Capital** – Canada has a world class banking system, well-regarded public markets, and growing venture capital activity.

**Extensive Government Support** – Provincial and federal governments have committed billions in funding over the next few years for the technology sector and support for technology companies in a number of programs, including substantial tax incentives for research and development.

### Section 2: Examples of high-potential Canadian technology industries

**Blockchain** – Canada, supported by incubators like the Blockchain Research Institute, already has a foothold in the blockchain industry, notably with respect to the development of cryptocurrencies like Ethereum and Bitcoin.

**Artificial Intelligence** – Companies, including General Motors and ROSS Intelligence, have opened AI R&D centers in Canada, in part because of the reputable AI programs and professors at Canadian universities, including Geoff Hinton (the "father" of AI).

**Cleantech** – Canada's established cleantech industry (11 Canadian firms made the 2017 Global Cleantech 100 List) will get a further boost from government support. The 2017 Federal Budget alone allocated \$2.2 billion in support for cleantech.

## Canada's Growing, Young, and Educated Population



### Tailored Growth Through Immigration

**Work-Ready Skills:** Canada approves immigrants based largely on their work-ready skills and potential contributions to the economy.

**Curated Process:** Canada is one of the first countries to move to an economic and family-based immigration system, and does not use a lottery-based visa system (such as that used in the US). In 2017, 60% of the 300,000 immigrants admitted to Canada will be selected based in part on their ability to contribute to the Canadian economy.

**Ease of Access:** Foreign nationals can work in Canada by way of the Temporary Foreign Worker Program, the International Mobility Program, or other qualifications-based immigration programs.

### Young

**Working Population:** Canada's working-age population (15-64) makes up a higher proportion of the overall population than that of any other G7 country.

### Educated

**Post Secondary Education:** On average, more Canadians have post-secondary education than citizens of any other country. In 2011, nearly 30% of Ontario's population and 36.8% of Toronto's population held a university degree.

**Core Universities:** The Toronto-Waterloo Corridor (region between Toronto and Waterloo with 15,000 tech companies, 200,000 tech workers and 5,200 start-ups) is home to many world class universities, including the University of Toronto, McMaster University, the University of Waterloo, Wilfrid Laurier University, York University, and Ryerson University.

**Incubators:** Ontario's universities have fostered some of its largest incubators, including Velocity and Communitech at the University of Waterloo, DMZ at Ryerson, MaRS at the University of Toronto and the Creative Destruction Lab at Rotman School of Management.

**Promising Future:** Ontario plans to increase the number of post secondary students graduating in science, technology, engineering and mathematics (STEM) disciplines by 25 per cent over the next 5 years, to 50,000 per year. This will give Ontario the highest number per capita of post secondary STEM graduates in North America.

# Established Technology Sector



## Homegrown and International

**National:** Many homegrown companies are reaching new heights, including Shopify, an Ottawa-based consumer technology firm with a market cap of \$9+ billion USD, and Hootsuite, a Vancouver-based social media management developer that has been valued at \$1 billion.

**Global Firms in Canada:** Global firms are setting up in Canada, including Amazon, Uber, Autodesk, Slack and Airbnb, joining established technology leaders IBM, Microsoft, Google, and Ericsson.

## Supercluster Initiative

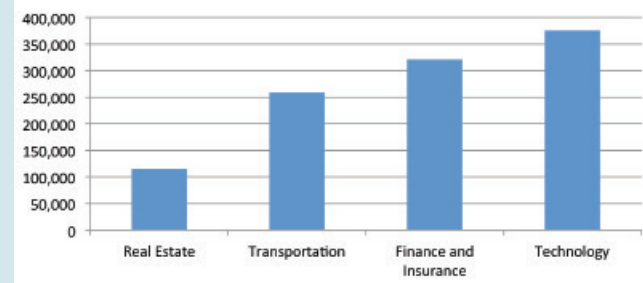
**Further Accelerating Tech:** In May 2017, the Minister of Innovation launched the \$950 million federal government initiative to select and develop up to five innovation superclusters in Canada. The program is intended to further accelerate innovation in Canada's high-growth sectors and strengthen Canada's economy as a whole.

## Significance to Economy

### In 2015, Canada's technology sector:

- Was responsible for \$117 billion (7.1%) of Canada's economic output;
- Comprised of approximately 71,000 firms, representing 6.1% of all Canadian businesses;
- Invested \$9.1 billion in R&D in Canada;
- Employed 864,000 workers, which accounted for 5.6% of Canada's total employment; and
- Provided its employees with an average wage of approximately \$67,000 per year, nearly \$10,000 above the national average.

Employees in Ontario by Sector (2015)



## Regulations Supporting Innovation



### Regulation

**Autonomous Vehicle (AV) Regulation:** Ontario placed itself at the forefront of AV development by permitting road testing of AVs. This regulation led, in part, to Uber establishing an Advanced Technologies Group for AV research in Toronto in 2017.

**Crowdfunding:** Ontario and other provinces have introduced regulations permitting equity crowdfunding. Equity crowdfunding, already an established industry in Europe and Asia, will assist Canadian start-ups to access capital (including from non-accredited investors).

**E-Commerce and Privacy:** Canada already has laws in place to facilitate e-commerce and emerging technology businesses as well as effective privacy legislation.

### Pro-Immigration Climate

**Increased Applications:** The Canadian government under Prime Minister Justin Trudeau announced an expedited work-permit process for qualified foreign talent. Canada's start-ups are seeing increasing job applications, especially from US workers.

**Ease of Access:** The Pan-Canadian Framework on Clean Growth and Climate Change proposes that provinces work together to enable expedited processing of visas and work permits for global talent, in particular for high-growth Canadian businesses such as those in the clean technology sector.

**Contrast to the US:** The current anti-immigrant political climate in the US makes Canada relatively more attractive to skilled international workers and students. Canadian universities have seen a substantial jump in applications from foreign students since the end of 2016.

**Attractive Quality of Life:** Canadians are consistently ranked as having one of the highest quality of life.

### Accessible Legal Support

**Professional Services:** Canada's cost environment for professional services is advantageous: international financial-services firms typically save 17.8% on total costs relative to their US-based counterparts. Canadian law firms, including Goodmans LLP, have specialized practices in the technology sector.

## Regulations Supporting Innovation



### Case Study: Ontario Securities Commission (OSC)

**LaunchPad:** In Ontario, the OSC unveiled the OSC LaunchPad, the first innovation hub introduced by a Canadian securities regulator aimed at facilitating the entry of Fintech companies into the securities regulatory framework.

**Approved Operators:** AngelList Syndicates, an American start-up funding platform, and Lending Loop, a start-up that provides P2P debt financing for small businesses, have both received regulatory approval by the OSC to launch in Ontario, pursuant to the OSC LaunchPad initiative.

### Case Study: Net Neutrality in Canada and the United States

**Leader in Net Neutrality:** Canada has emerged as a world leader in supporting net neutrality, the principle that all content and applications should be treated equally and that choices made by Internet users should be free from ISP or telecom interference. Net neutrality puts consumers and creators in the Internet driver's seat.

**Regulation of Net Neutrality:** The CRTC released Telecom Regulatory Policy CRTC 2017-104 in April 2017. The Policy extends the Canadian government's protections to so-called "zero rating", meaning that ISPs cannot offer specific services unless they count toward data usage. ISPs are also not allowed to block or slow down specific traffic.

**In Contrast to the US:** The newly-appointed head of the US FCC, Ajit Pai, plans to overturn net neutrality rules established under Obama in 2015.

# Ease of Raising Capital



## World-Class Banking System

**Ranking:** The Canadian banking system has been ranked the soundest in the world by the World Economic Forum for seven years in a row.

**Area:** The Toronto-Waterloo Corridor is well positioned to benefit from Canada's financial sector. The corridor has the second-highest concentration of large bank headquarters in the world and accounts for more than \$1.5 trillion in institutional investor capital.

## NFPs Supporting Innovation

**Futurpreneur Canada:** Futurpreneur Canada is a national not for profit providing capital, advice and support to entrepreneurs between the ages of 18 and 39. In collaboration with the Development Bank of Canada, Futurpreneur offers up to \$45,000 in loans targeted at businesses that have passed the research and development stage but have been operating for fewer than 12 months. Financing is conditional on participation in the Futurpreneur mentorship program. Futurpreneur has helped launch over 8,000 Canadian businesses.

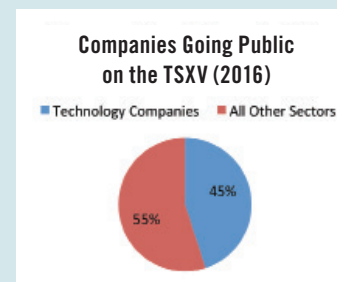
**Arctern Ventures:** Arctern Ventures is a fund devoted to early stage cleantech businesses. The target sectors for the fund are power generation, resource use, advanced manufacturing and materials, agricultural technology and transportation. Arctern has supported companies like Smarter Alloys, which is the only company in the world capable of programming multiple shape "memories" into smart alloys.

## Public Market

**TSX Venture:** Canada is home to the TSX Venture Exchange (TSXV), known as Canada's "public venture market". The TSXV offers a viable alternative for many small cap technology companies looking to raise venture-staged growth capital.

**Public Activity:** The new technology companies that went public on the TSXV in 2016 represented approximately 45% of all corporate "going-public" activity on the exchange in 2016.

**Amount Raised:** Over 115 different technology companies raised an aggregate of over \$700 million on the TSXV in 2016.



## ■ Ease of Raising Capital



### VC Activity in Ontario

**Ontario Activity:** Consistent with 2016, the vast majority of venture capital activity took place in Ontario, with 34 deals totaling \$286 million USD in Q1 2017.

**VC Draw:** The Toronto-Waterloo Innovation Corridor has helped advance Ontario from 14th to eighth in venture capital attraction, with Ontario receiving more foreign capital investment in key sectors such as automotive and life sciences than any other North American jurisdiction over the past two years.

### VC Activity in Canada

**Growth:** In the first quarter of 2017, business gross-fixed-capital formation – Statistics Canada's measure of business capital investment – surged at an annualized pace of better than 12%, the sharpest in seven years.

**2017 Budget:** The 2017 Budget allocated \$400 million over three years to support venture capital investments in Canada, starting in 2017-18 through a new Venture Capital Catalyst initiative. With funds leveraged from the private sector, this investment could inject around \$1.5 billion into Canada's innovation capital market.

**Deal Size:** Fundraising dollars in Q1 2017 remained strong, increasing 10% in comparison to Q1 2016. In addition, average deal size has increased to \$7.2 million USD from \$5.3 million USD.

**International Investors:** Toronto start-ups are drawing investments from funds all over the world including: Union Square Ventures, Khosla Ventures, Horizon Venture Partners, Azure Capital, Felicis Ventures, and Sequoia Capital. Union Square's Fred Wilson recently said in a blog post that Toronto was his firm's No. 3 location for investment after New York and San Francisco.

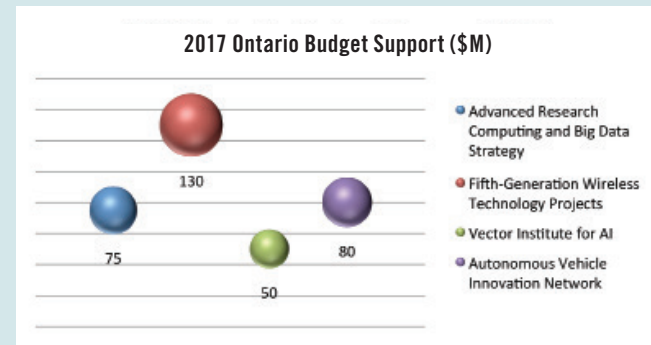
# Extensive Government Support



## Ontario Support for Innovation

### The 2017 Ontario Budget Includes:

- \$75 million over five years toward the Advanced Research Computing and Big Data Strategy designed to support operating costs for advanced computing across Ontario and new hardware investments at the Universities of Toronto and Waterloo.
- \$130 million over five years on two projects to develop fifth-generation wireless technology. This aims to increase network capacity and speed for mobile and connected devices and to serve as infrastructure for new technologies such as autonomous vehicles.
- \$50 million toward the development of the Vector Institute for AI, which will focus on developing AI technologies. The federal government and other private-sector actors have also committed significant funding to the Vector Institute.
- \$80 million over five years, in partnership with the Ontario Centres of Excellence, to create the Autonomous Vehicle (AV) Innovation Network.



## Extensive Government Support



### Nationwide Support for Innovation

**Business Development Bank of Canada (BDC):** The BDC is a federal organization which is dedicated exclusively to funding entrepreneurs in Canada. It provides investment capital for technology entrepreneurs at the early stages of a company's lifecycle.

**Sustainable Development Technology Canada (SDTC):** The SDTC funds Canadian cleantech projects while providing coaching and mentorship to companies in the cleantech space. The SDTC has been allocated \$400 million over the next five years to provide investment capital to assist technology entrepreneurs to commercialize promising clean technologies

**Provincial Organizations:** Ontario Capital Growth Corporation (OCGC), Alberta Innovates, BC Tech Fund, and Nova Scotia's Innovacorp are all independently run corporations which are backed by provincial governments. These funds provide capital investments to high-growth, emerging technology companies, with funded businesses receiving initial investments of up to \$5 million and lifetime aggregate investments of up to \$25 million.

### The Scientific Research & Experimental Development Tax Incentive (SR&ED)

**Purpose:** The SR&ED is designed to encourage and provide small businesses with the ability to perform scientific research and experimental development. It is the largest source of federal government support for technology companies.

**Scope:** Considered one of the most generous and accessible research and development tax incentive programs in the world, it is utilized by over 20,000 businesses for well over \$3 billion in total funding annually.

**Function:** Companies can deduct expenditures from income for tax purposes, receive a credit to reduce income tax payable, or qualifying companies may receive a tax refund.



# ■ Case Studies

1. Blockchain 2. Artificial Intelligence 3. Cleantech

## Blockchain



### Overview

- Blockchain is a distributed ledger on which you can store anything of value, ranging from money, stocks, bonds and intellectual property, to votes, art, music, loyalty points, carbon credits, health-care records and accomplishments.
- Blockchain has the potential to revolutionize financial services by integrating technologies such as AI, autonomous vehicles, the Internet of Things and robots into our economy. Governments may shift their computer systems to blockchain – even our currencies could become digitalized based on blockchain (blockchain is the underlying technology for cryptocurrencies like Bitcoin and Ethereum).

### Potential in Canada

**Start-up Incubators:** Canada has a growing number of start-up incubators, including The Blockchain Research Institute – a multi-million dollar blockchain think tank – launched in Toronto in March of 2017.

**Banks:** Canada's banks – large, stable and willing to pivot – are ideally situated to foster blockchain growth.

**Ethereum:** Arguably the most important blockchain company in the world, Ethereum is already valued at over \$1 billion USD. The developer of the technology is Canadian, as are many of Ethereum and Bitcoin's core developers.

**Existing Tech Corridor:** The tech corridor between Toronto and Kitchener-Waterloo is already a world leader in quantum physics and AI. Blockchain is well-suited to be another industry to boom.

### Blockchain Research Institute (BRI)

Toronto is home to the BRI, a thought-leading organization focused on the strategic implications of blockchain, with significant industry support.

# Artificial Intelligence



## Overview

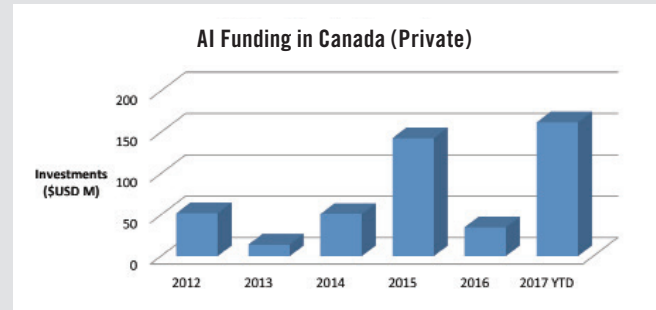
- AI is a burgeoning field with significant potential. \$90 billion of growth is expected in the global AI solutions market by 2020.
- In 2015, the Creative Destruction Lab – an incubator based at the University of Toronto – favoured AI start-ups, with 25 companies admitted. In 2016, 50 AI start-ups were admitted; 2017 will likely have 75 according to its founder.
- Just as silicon technology formed the backbone of innovation in Silicon Valley, AI and quantum computing will be at the heart of every sector – the regions that lead will dominate for years to come.
- Ontario is especially well positioned to lead in C/AV technologies, as it's North America's top vehicle producing jurisdiction, and second only to California for information and communications technology companies.

## Investment

**Federal Government Support:** In the 2017 Federal Budget, the Canadian Government pledged \$125 million to support AI research centers in Toronto, Montreal and Edmonton.

**Provincial Government Support:** The Ontario Government is investing \$80 million in the Autonomous Vehicle Innovation Network, a demonstration zone that allows researchers to hone the technology and test AV in a range of everyday, real life traffic scenarios.

**Research Funding:** Google and Uber are key investors in the Vector Institute, an independent, non-profit research institution dedicated to the field of artificial intelligence, which raised \$180 million in funding this year.



## Artificial Intelligence



### Academic Expertise

**University of Toronto:** U of T ranks among the world's largest institutions in terms of the number of faculty and students focusing on AI research.

**Ties to AI Academic Communities:** U of T's AI faculty has strong ties to other nearby AI communities, including those at the University of Waterloo and the Université de Montréal.

**Support for Tech Industry:** These academic institutions provide support to the Toronto-Waterloo Innovation Corridor, which contains a high concentration of start-ups and supporting infrastructure.

### Canada's Connections to Silicon Valley

**Academic Connections:** Many of Geoff Hinton's ("father" of AI and deep learning) former students hold important positions in AI in Silicon Valley, including the current directors of AI Research at Facebook and Apple.

**Canadian Start-ups Coming Home:** Canadian-born start-ups that have established a presence in Silicon Valley are expressing interest in returning. When ROSS Intelligence announced the opening of a Toronto office this year, the co-founders emphasized that Toronto is at the "forefront of AI research."

**Big Companies Looking North:** Google is starting an AI lab in Toronto, and helping to fund a public-private partnership with the University of Toronto to develop and commercialize AI talent and ideas. Other large companies like Thomson Reuters and General Motors have moved their AI divisions to Toronto.

**Governmental Efforts:** Canadian consular officials are focused on connecting Canadian start-ups with investors and facilitating their growth.

## Cleantech



### Overview

Cleantech is an umbrella term encompassing the investment asset class, technology and business sector, which include clean energy and environmentally sustainable products and services.

### Electric Vehicles

**High Demand:** Sales went up 56% in 2016 compared to 2015. There are approximately 30,000 electric vehicles in Canada.

**Budget Increases:** The 2017 federal budget builds on the 2016 budget's investments by providing an additional \$120 million to deploy on infrastructure for electric vehicle charging and refueling stations, for alternative fuels such as natural gas and hydrogen, and to support technology demonstration projects and develop enabling codes and standards.

**Government Incentives:** The Ontario government offers up to \$14,000 off the purchase of an electric car, up to \$1,000 off the purchase and installation of a home charging station and a green license plate that allows drivers to use high-occupancy vehicle/toll lanes when driving alone.

### Solar Tech

**Natural Resources Industry:** Canada is home to 14 of the 19 metals and minerals that go into producing solar panels. As solar PV systems become the planet's cheapest source of energy and the demand for solar power grows, so too will Canada's mining industry.

**Established Sector:** Canadian Solar, one of the world's largest solar panel makers, is based in Guelph, Ontario. Leading start-ups, such as Morgan Solar, are based in Toronto.

### Leading Cleantech Industry

**Canadian Companies:** Canada has leading companies in a diverse range of cleantech industries including, advanced materials, energy storage, energy efficiency, smart grid, agriculture, nuclear, recycling and waste, conventional fuels, and water & wastewater. Eleven Canadian firms made the 2017 Global Cleantech 100 List (produced by the San Francisco-based Cleantech Group).

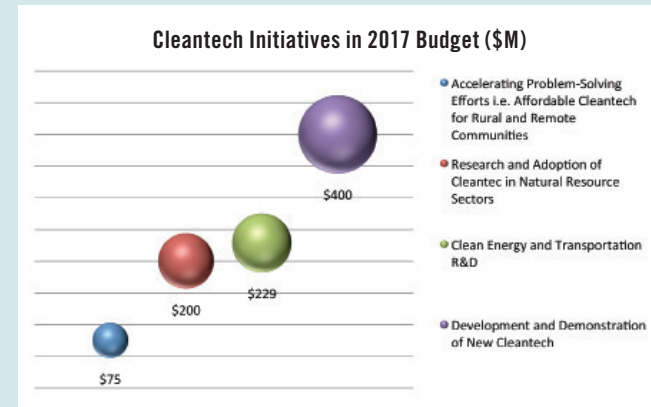
## Cleantech



### Support Under the Canadian Financial Budget

#### Federal Budget Includes...

- Over \$2.2 billion to support clean technology research, development, demonstration and adoption as well as to accelerate the growth of cleantech companies.
- \$229 million over four years, starting in 2018-19, to Natural Resources Canada and Transport Canada to continue R&D activities through their core clean energy and clean transportation innovation programs.
- \$200 million over four years, starting in 2017-18, to Natural Resources Canada, Agriculture and Agri-Food Canada and Fisheries and Oceans Canada to support cleantech research and the development, demonstration and adoption of cleantech in Canada's natural resources sectors.
- \$15 million over four years, starting in 2017-18, for Global Affairs Canada to implement a strategy to support Canadian firms in becoming world leaders in cleantech and capitalize on growing global market opportunities.
- \$50 million, starting in 2017-18, to launch a new procurement program, Innovative Solutions Canada, modelled on the very successful U.S. Small Business Innovation Research program, to test and validate Canadian technologies.



### Other Federal Financial Support

**BDC Capital:** The Business Development Bank of Canada is launching a new \$125 million venture capital fund to support Canadian energy and clean technology start-up businesses with global potential. The Industrial, Clean and Energy Technology (ICE) Venture Fund II will invest in 15-20 high-impact Canadian cleantech start-up firms that demonstrate efficiency and strong scalability.

## ■ Cleantech



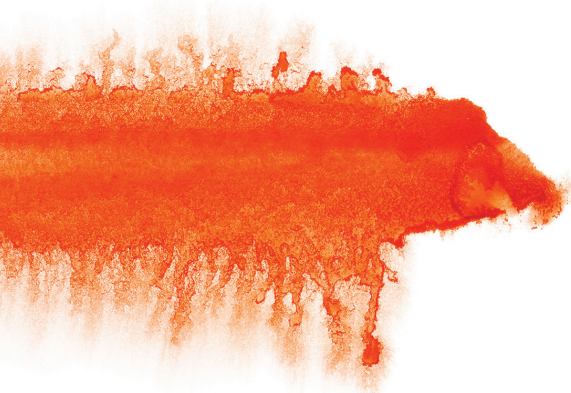
### Federal and Provincial Support

**Government Commitment:** Government procurement helps drive cleantech adoption, with the federal government setting a goal of using 100% clean power by 2025. To achieve this, all levels of government will scale up investment which pushes cleantech development and deployment forward.

**National Strategy:** The Pan-Canadian Framework on clean growth and climate change is the government's plan to meet its emissions reduction target and grow the economy. The federal government is committed to doubling its cleantech investments over five years.

**Provincial Programs:** Provincial governments have announced carbon taxes and cap and trade programs, the proceeds from which (estimated to total more than \$2 billion in 2017) will go towards investment in green technologies and support for cleantech innovation.

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