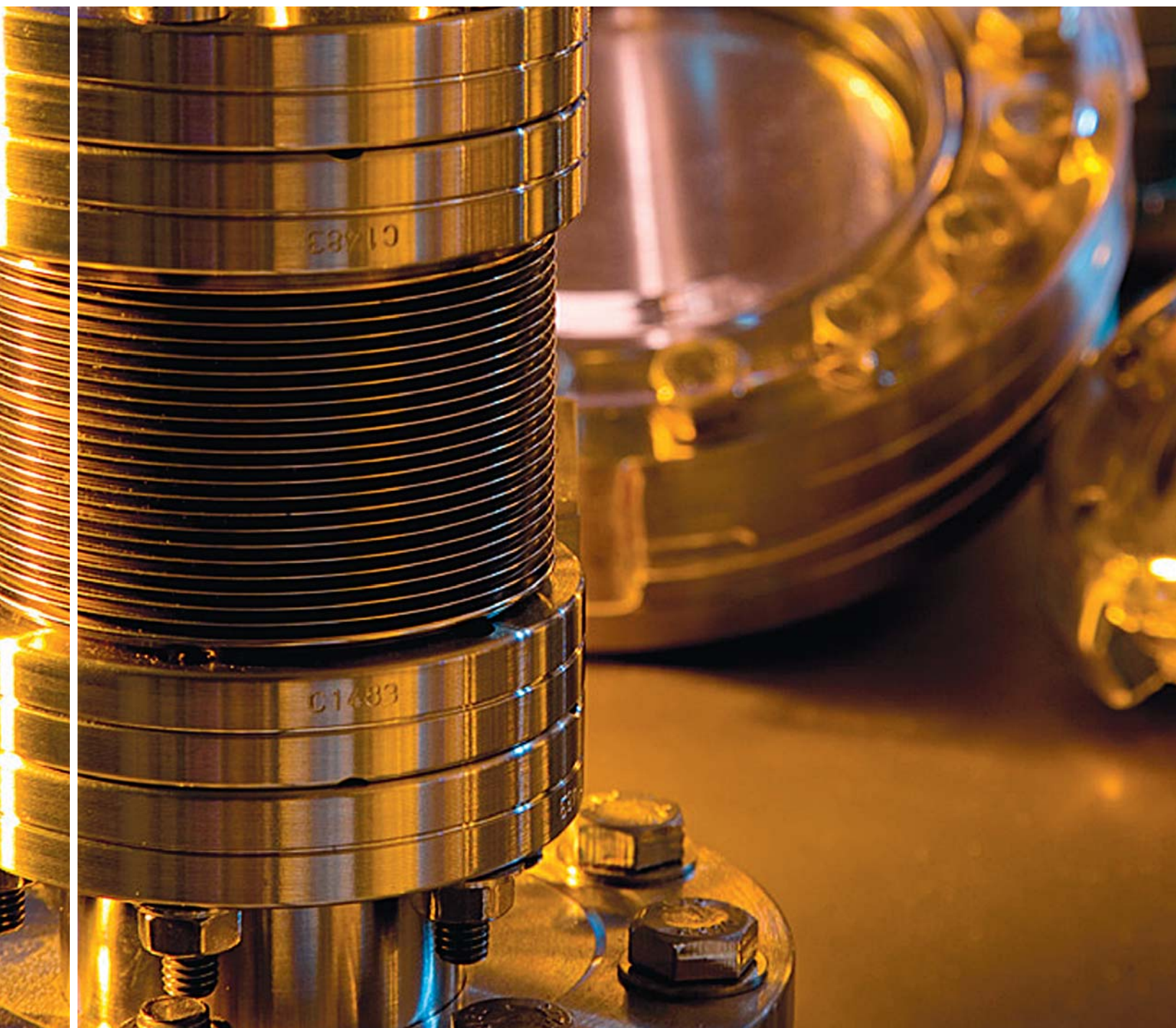


2009

# Invest in Canada PHOTONICS



Canada 

## LEADING FIRMS IN CANADA

AVO Photonics  
Boreal Laser Inc.  
BTI Systems  
Carmanah Technologies  
Cyrium Technologies Inc.  
DALSA  
Elcan Optical Technologies  
Enablence  
EXFO  
Group IV Semiconductor  
JDSUniphase  
Meriton Networks (Xtera)  
MPB Technologies  
NxtPhase  
Optech  
TeraXion

Canada is a worldwide leader in photonics, a \$710 billion<sup>1</sup> global industry that is pushing back the boundaries of fields as diverse as information and communications technologies, life sciences, manufacturing, consumer products, sensors, defence, efficient lighting, automotive and aerospace.

In Canada, photonics generates roughly \$4.5 billion annually in revenues and employs some 20,000 people in approximately 370 companies. The workforce is highly skilled, with 40 percent involved in research and development (R&D). Canadian products are globally competitive, with 85 percent of the photonic goods produced in Canada being exported worldwide.

## Key Capabilities

**Research and development:** Canada is serious about investing in photonics research and development, and spends an estimated \$150 million per year on photonics activities. From 2003 to 2005, Canada invested over \$300 million in photonics facilities.

Canadians are partnering with international researchers on projects such as molecular imaging through facilities that include the Advanced Laser Light Source in Montréal, one of only two femtosecond (ultra-fast) laser facilities in the world. TRLabs, western Canada's largest information and communications technology consortium, has issued or filed 95 patents and commercialized 329 technologies since its inception. The City of Québec's National Optics Institute, one of North America's most prominent optics centres, has generated almost 100 patents.

To encourage innovation, Canada also provides investors with provincial and federal R&D tax credits and deductions. Canada's Scientific Research and Experimental Development program (SR&ED), one of the most generous tax credit programs in the G7, allows investors to credit a portion of R&D related costs such as wages, materials, machinery, equipment and overhead.

**Commercialization:** Canadian-based companies are successfully commercializing research and innovation. An excellent example includes Optech, spun off in the 1970's from York University's groundbreaking project to map weather on Mars with an innovative Light Detection and Ranging (LIDAR) optical remote sensing system. TeraXion represents another good example, having shipped by September 2008, 5,000 units of the University of Laval's 40 gigabit per second tuneable dispersion slope compensator, developed the previous year.

The Canadian Photonics Fabrication Centre (CPFC) provides a world-class industrial grade facility that bridges the gap from innovation to product commercialization. Companies can drive innovation and reduce the risk of investing in new technologies by taking advantage of the prototyping services of the CPFC.



Approximately 20,000 highly skilled employees work in Canada's photonics industry, of which 40 percent are involved in R&D

<sup>1</sup> Unless otherwise noted, all values are in Canadian dollars.

## British Columbia

British Columbia is home to approximately 50 companies in the photonics industry. The province's three major universities—the University of British Columbia and Simon Fraser University in **Vancouver** and the University of Victoria—collaborate closely. This hub of expertise, research and facilities has generated spin-off companies and technologies such as Switch Materials, developer of revolutionary new materials that “switch” optical properties on command. Simon Fraser's 4D LABS offers firms state-of-the-art equipment to pursue research and development on advanced materials and nanoscale devices. Photonics companies in British Columbia are active in the lighting and signage field, as well as in alternative energies such as solar.

## Alberta

Alberta continues to develop photonics-based solutions for applications in its very strong oil and gas sector; for example, newly created hand-held sensors allow monitoring of leaks from long distances. TR Labs and the University of Alberta's Ultrafast Photonics and Nano-Optics Lab conduct research in photonics. By 2020, the government of Alberta expects its \$130 million investment in nanotechnology to generate \$20 billion in new economic activity, of which nanophotonics will play an important role. The National Institute for Nanotechnology (NINT) and the Alberta Centre for Advanced Microsystems and Nanotechnology Products (ACAMP) are active in photonics, while the provincial government's nanoAlberta team supports nanotechnology collaboration.





## Ontario

Ontario is a global hub in photonics with more than 60 percent of Canada's photonics industry based in two of Ontario's clusters, **Ottawa** and **Toronto**, which are recognized as world-leading centres for photonics research and commercialization. Another leading center for technology, **Waterloo Region**, is also home to several photonics firms. Thousands of highly educated people work in Ontario's photonics sector, complemented by a steady stream of new talent—some 29,000 graduates a year in math, engineering and sciences.

Ontario is home to over 60 research centres that support the industry, including the Centre for Research in Photonics at the University of Ottawa and the Optical Technology Centre at the University of Toronto. Committed to commercializing leading-edge science, the province also has a number of incubators and research parks. Toronto's MaRS Centre, Ottawa's Life Sciences Technology Park and Canadian Photonics Fabrication Centre, and the University of Waterloo Research and Technology Park are just some of the energetic environments that spur businesses to innovate and bring new products to market.

Ontario's photonics community has produced many world-leading products, from optical components based on fibre Bragg gratings and integrated optical components for wavelength division multiplexing, to devices based on quantum confined structures and ultra-fast lasers.

## Quebec

Since the 1970s, the **City of Québec** area has been a leader in photonic applications markets, from instrumentation to imagery, vision systems, optical communications and high-performance fibre optics. The province of Quebec's optics-photonics sector includes over 100 companies employing close to 5,000 specialists and generating revenues of close to \$1 billion, of which 70% is sourced to the City of Québec area.

The City of Québec is known for its world-class centres of expertise, including The National Optics Institute which has generated over 20 spin-off companies since its establishment in 1985. The region has remained at the forefront of innovation thanks to eight world-class centres, including: the Centre d'optique photonique et laser, the largest university research centre in optics-photonics in Canada and the Canadian Institute for Photonic Innovations, the head of a network of 18 universities that offer technology exploitation and innovation programs.





# INVESTMENT LOCATION BENCHMARKING

## METHODOLOGY

This benchmarking study assesses the competitiveness of a number of Canadian clusters against competing international business locations. Based on an investor's perspective, the research and analysis uses a representative investment project prototype (an operation involving research, development and manufacturing of high precision communication optical components and systems—see profile on page 5) to assess criteria that corporate decision makers typically examine when evaluating location alternatives for foreign investment.

This international location benchmarking exercise was conducted by IBM-Plant Location International (IBM-PLI), a renowned global location consultancy. IBM-PLI performed objective research to assess the comparative cost and quality of doing business in various locations, simulating the approach used by investors when screening candidates for corporate investment projects. The benchmarking study examined 250 to 300 financial and qualitative location indicators in the assessment of each industry subsector.

To assess the quality of a location's operating business environment, data were collected from a variety of sources for the different subfactors in each of the categories featured in the operating environment table (page 5). Data for the qualitative assessment were translated into comparable scorings (zero to 10) for each category and subfactor using a weighted scoreboard approach. Weights were assigned to each location category and subfactor to demonstrate their relative importance in the location selection process. These weights are specific to each industry subsector and are based on IBM-PLI's experience in helping investors make strategic decisions when choosing locations.

A high-level financial analysis was also completed to take into account major location sensitive operating costs for each representative project profile. Operating cost projections have been calculated and discounted over a 10-year period, incorporating anticipated inflation rates, to determine their net present value.



benchmarking the comparative  
cost and quality of doing  
business in global locations



# INVESTMENT LOCATION BENCHMARKING

## REPRESENTATIVE PROJECT PROFILE



### GENERAL DESCRIPTION OF OPERATIONS

Research, development and manufacturing of high precision communication optical components and systems.

### KEY PROJECT DRIVERS

- » Availability of suitably skilled staff: engineers, PhD level scientists, technicians
- » Access to research and technology through proximity to universities with photonics departments
- » Cluster of other photonics companies
- » Market proximity

### OPERATING COST ANALYSIS

#### PROJECT REQUIREMENTS FOR FINANCIAL MODELLING

#### LABOUR

(HEADCOUNT = 105)  
Electrical and Electronic Engineering Technicians: 43  
Electrical and Electronic Equipment Assemblers: 31  
Machinists: 7  
Management and Administration: 4  
Engineers: 15  
Materials Scientists: 5

#### PROPERTY

Land: 2 acres  
Building: 47,344 sq ft

#### UTILITIES

Power:  
(Monthly Consumption)  
17,043 kwh  
Water:  
(Daily Consumption)  
15,000 gal

## OPERATING ENVIRONMENT

<b>GENERAL BUSINESS ENVIRONMENT</b> » 5%*	» Availability of financial support & incentives; » Economic and financial stability; » Compliance with protection of privacy regulations, information security, IP rights; » Political stability; » Quality of support from local government & development agencies; » Business permitting procedures
<b>LOCAL POTENTIAL TO RECRUIT SKILLED STAFF</b> » 30%*	» Presence of experienced photonics employees, including manufacturing related; » Overall size of labour pool; » Presence of student population; » Overall tightness in the labour market (unemployment)
<b>PRESENCE OF INDUSTRY/CLUSTER</b> » 30%*	» Presence of industry base; » Importance of R&D; » Market proximity
<b>FLEXIBILITY OF LABOUR &amp; REGULATIONS</b> » 5%*	» Working time regulations; » Hiring & firing flexibility; » Work permits; » Industrial relations/attitude of unions
<b>INFRASTRUCTURE &amp; COMMUNICATIONS</b> » 5%*	» Air access; » Quality & reliability of IT & telecommunications; » Reliability of power supply; » Highway network & congestion; » Public transport
<b>REAL ESTATE</b> » 5%*	» Availability of large industrial space
<b>LIVING ENVIRONMENT</b> » 20%*	» Cost of living; » Attractiveness for young international recruits; » Attractiveness for expatriates



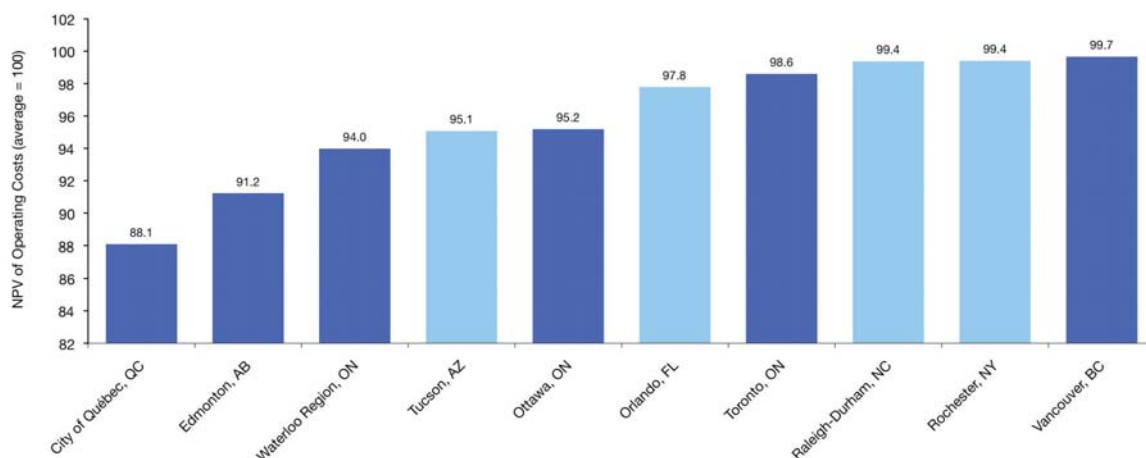


# CANADA'S VALUE PROPOSITION

Canadian ICT hubs offer businesses strong and financially attractive operating environments. Established photonics clusters across Canada bring together universities, research centres, businesses and professional associations that provide the industry with world-leading pools of knowledge and expertise.

## COST ASSESSMENT\*

■ Canadian  
■ Non-Canadian  
C\$1 = US\$0.862



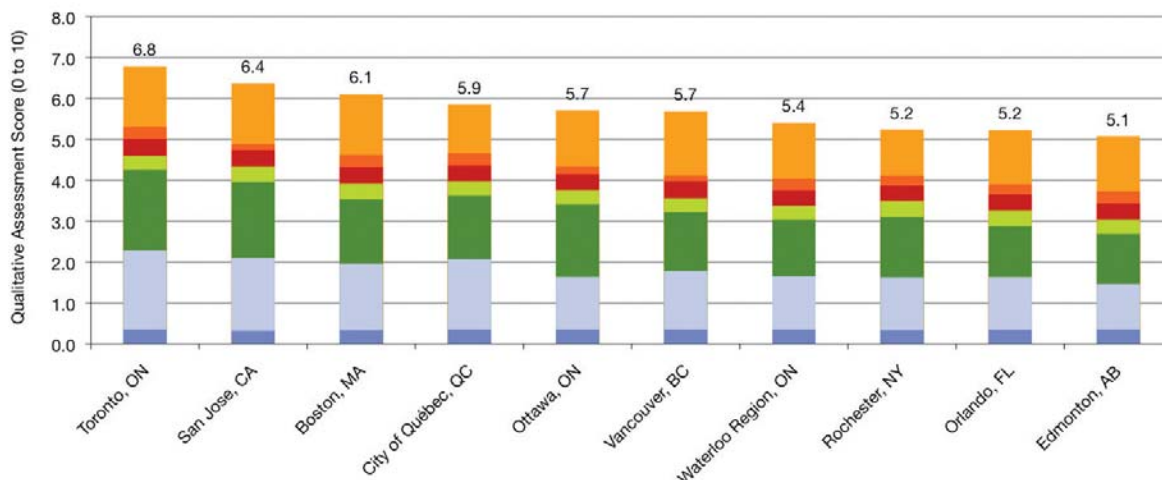
## Favourable operating costs

Canadian locations offer very competitive costs compared to locations from advanced economies and other North American cities analyzed in this benchmarking study. The City of Québec, Edmonton and Waterloo Region all offer a more cost-competitive

alternative than any U.S. location. Among larger cities, Vancouver and Toronto also outperform comparably-sized U.S. cities, offering investors significantly lower operating costs.

## QUALITATIVE ASSESSMENT OF OPERATING ENVIRONMENT\*

■ Living environment  
■ Real estate  
■ Infrastructure & communications  
■ Flexibility of labour & regulations  
■ Presence of industry/cluster  
■ Local potential to recruit skilled staff  
■ General business environment



## A wealth of options to choose from

Canada offers a strong qualitative proposition for photonics investment. IBM-PLI's assessment of the operating environment, ranks Toronto as the top North American location benchmarked. Other Canadian cities, including the City of Québec, Ottawa and Vancouver, rank in the top five in North America, while Waterloo

Region and Edmonton round out the top 10. A critical factor to this overall score is Canada's appealing living environment which is important for attracting international talent with vital specialist knowledge. Canadian locations also rank well on essential criteria such as skills availability, R&D, and cluster presence.

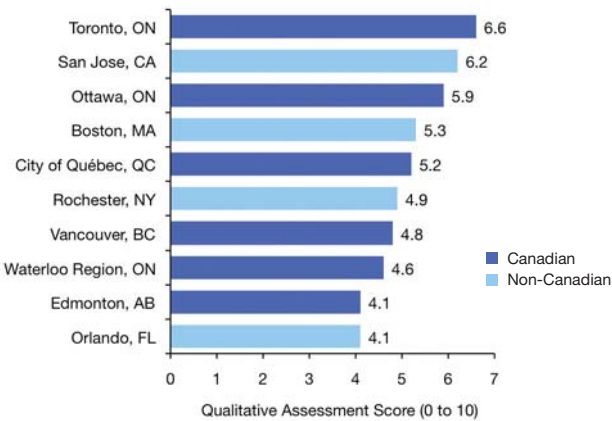
\*Unless otherwise noted, graphs represent IBM-PLI assessment scores.



# CANADA'S VALUE PROPOSITION



## Presence of industry/cluster (highest-ranking cities)\*



## Strong industry presence

Proximity to customers, such as electrical equipment manufacturers and telecommunication companies, the number of photonics-related companies and strength of R&D are all critical factors when assessing investment locations.

Canada is home to a well-developed photonics sector. Many Canadian cities host vibrant photonics and related industry clusters that are supported by a network of well organized associations, private-public research partnerships, business incubators and research institutes dedicated to photonics.

One such example, the Canadian Photonics Fabrication Centre located in Ottawa, works with start-ups, small and medium-sized companies, large corporations, government laboratories and academia to provide prototyping and production runs of photonic devices and photonic integrated circuits.

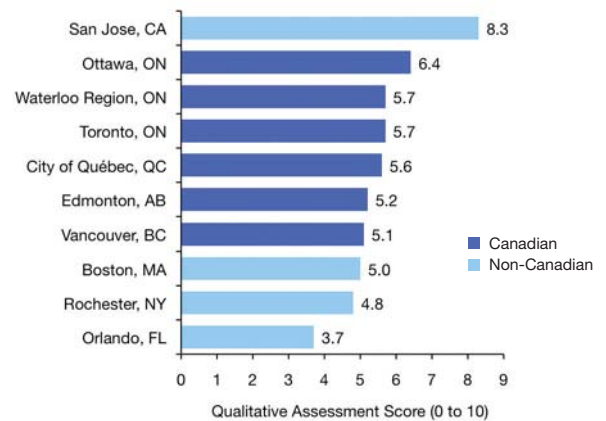
## Cutting-edge R&D

The amount of R&D expenditure, top-notch university research institutions, and successful photonics-related patents highlight Canada's research strength in this field.

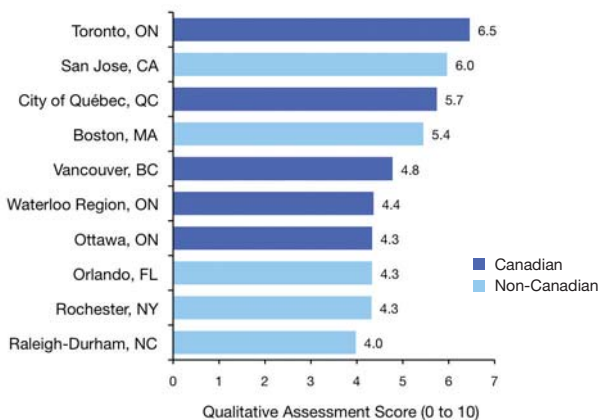
Canada understands that R&D and innovation are critical for fostering growth. New applications for photonics technology continuously emerge, influencing many sectors. Canada invests billions annually to ensure that investors have access to the best R&D talent and infrastructure in the world.

Canada also provides the Scientific Research and Experimental Development tax incentive and provincial tax credits to help firms reduce the cost of R&D expenditures and to promote innovation. Perhaps this explains why Canada received U.S. patents for over 290 innovations related to optical communications from 2002-2007.

## Research and development (highest-ranking cities)\*



## Potential to recruit staff (highest-ranking cities)\*



## A deep talent pool

The size of the labour market and the presence of experienced engineers, physicians and researchers are critical to the success of R&D activities. Student populations in related fields are also important as a source of new, educated employees.

Ranked first in the world for higher education<sup>1</sup>, Canada is home to an exceptionally well-educated, talented, and diverse workforce. Canadian locations analysed in this study offer a large talent pool with skills relevant to the sector, including a steady supply of engineering graduates. With a large number of engineers and individuals employed in photonics research and design, Toronto and the City of Québec place first and third respectively in North America in this category.



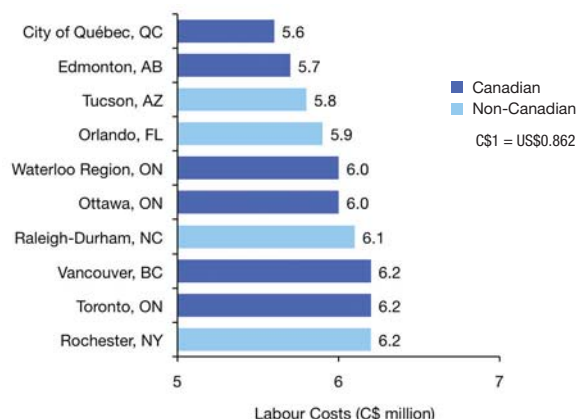
## Advantageous labour costs

A calculation of the estimated annual labour costs for a typical photonics research, development and manufacturing operation identifies the significant cost saving potential of Canadian locations over U.S. counterparts.

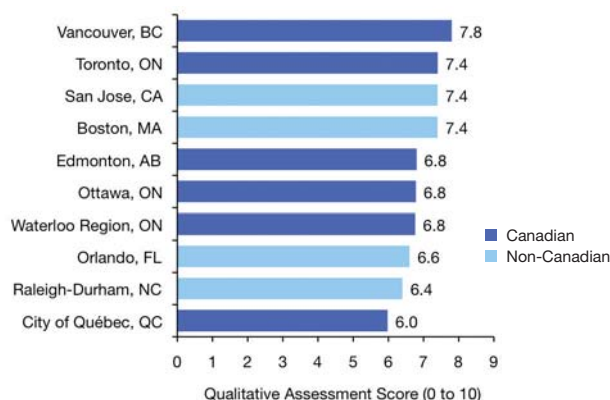
An important component of Canada's labour cost advantage relative to the United States comes from the lower costs of providing employee benefits. Canada's national healthcare system implies that most medical insurance costs are publicly funded rather than paid by the employer, resulting in significant savings.

The City of Québec and Edmonton both operate with labour costs below that of any U.S. city studied, while Vancouver and Toronto also show more competitive labour cost levels than similarly-sized U.S. locations.

Estimated annual labour costs<sup>1</sup> (highest-ranking cities)\*



Living environment<sup>2</sup> (highest-ranking cities)\*



## Outstanding quality of life

Attracting global talent and knowledge to maintain business capabilities is important in a highly specialized field like photonics where companies require know-how and expertise spanning physics, engineering and other experimental sciences.

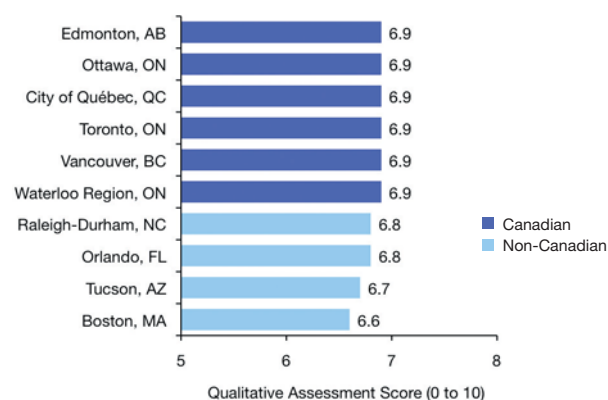
International measures such as the Mercer Cost of Living Survey, Sperling's Cities Ranked & Rated and Economist Intelligence Unit's quality of life index place Canadian cities near the top of the rankings. With its natural beauty, comparatively low cost of living and superior quality of life, it comes as no surprise that Canada is one of the best places in the world to live. That explains why Canadian cities attract young international recruits and talented expatriates from around the globe.

## A conducive business environment

Economic stability, support from government and local economic development agencies, R&D incentives, business permitting procedures, financial support available to business, privacy regulations, information security and intellectual property rights are important considerations for businesses when investing or expanding their operations.

Canada has created an advantageous business environment for companies to invest and flourish. With only two procedures required to get the operations going, compared to six for the U.S., Canada makes it easy for new investors to be in business. As the leading country among the G7 for GDP growth over the last decade, and with the world's soundest banking system<sup>3</sup>, Canada provides a safe and strong business environment with tremendous growth potential for your investment.

General business environment (highest-ranking cities)\*



\*Unless otherwise noted, graphs represent IBM-PLI assessment scores. 1 Source: IBM-PLI calculations based on Watson Wyatt 2007/2008 and Economic Research Institute (ERI) 2008. 2 Source: IBM-PLI evaluation based on Economic Research Institute and Mercer Cost of Living Index 3 World Economic Forum Global Competitiveness Report 2008-2009, October 2008.

# Invest in Canada

## at your service

### We offer the following valuable services to our clients:

- strategic market intelligence on your specific sector
- direct contact with key decision-makers in the government
- referrals to contacts in firms and industry associations, as well as experts
- information and advice on setting up a business in Canada
- help in identifying a suitable place in which to invest
- assistance in developing a business case for your next investment decision

Our global network will show you why Canada is your strategic choice for growth.

To reach an investment officer in your market, please visit:

[www.investincanada.com/globalnetwork](http://www.investincanada.com/globalnetwork)

Invest in Canada Bureau  
Foreign Affairs and International Trade Canada  
111 Sussex Drive  
Ottawa, ON, Canada K1N 1J1

Email: [investincanada@international.gc.ca](mailto:investincanada@international.gc.ca)  
Website: [www.investincanada.com](http://www.investincanada.com)

Catalogue Number FR5-38/12-2009E-PDF  
ISBN Number 978-1-100-12054-6

This publication was prepared by Invest in Canada in cooperation with IBM-PLI. The document covers a wide range of issues and is not intended to be a detailed nor an exhaustive reference. Accordingly, before relying on the material herein, readers should independently verify its accuracy, currency, and relevance for their purposes and should seek appropriate professional advice. Any reference to companies or investments is for illustrative purposes only and does not constitute an endorsement of those companies or investments. Details of sources for all quoted facts and figures are available upon request. The Government of Canada does not accept any liability in relation to the contents of this work. This publication is printed on recycled paper and is available in multiple languages including French. © Her Majesty the Queen in Right of Canada, as represented by the Minister of International Trade, 2009.



Waterloo Advanced Technology Lab (Ontario, Canada)