

Survey on Canada's S&T Strengths and Capacity

To help set the context for the government's consideration of Science and Technology (S&T) policy, the Council of Canadian Academies has been asked to report on:

- the scientific and engineering disciplines (including social sciences and humanities) in which Canada excels in a global context;
- the technologies where Canada excels in a global context;
- the S&T infrastructure that currently provides Canada with unique advantages; and
- the scientific and engineering disciplines and technologies that have the potential to emerge as areas of significant strength for Canada and generate important economic or social benefits.

We are canvassing a broad spectrum of informed opinion to help ensure that government S&T policy has a sound base of evidence. We would therefore appreciate your completion of the following questionnaire.

The questionnaire is to be completed online

The questionnaire should take about 20 minutes to complete

Data in the final report will be aggregated in order to preserve anonymity of individual respondents

The Council's report to government will be made public

Responses to the survey will be combined with other data and analysis to draw a multi-faceted picture of Canada's S&T capabilities in an international context.

Please submit your completed questionnaire as quickly as possible (but not later than August 8) to allow adequate time for analysis before the August 30 deadline for submitting our first report to the government.

We thank you for taking the time to share your experience and wisdom to help develop an authoritative and up-to-date picture of Canada's S&T assets.

Instructions: This survey is intended to record your personal opinion of Canada's standing – relative to our peer group of advanced countries – in a broad range of S&T fields and components of infrastructure. We do not expect you to do any research to respond. Rather, we are seeking your informed judgment.

To facilitate tabulation of responses, as well as comparison with bibliometric and other statistical data, we have adopted a taxonomy of major fields and sub-fields that seeks an adequate degree of "granularity" but inevitably involves compromises. Since no classification is ideal – particularly as increasing multi-disciplinarity blurs the traditional boundaries – we provide for "other" categories to be added by you if necessary.

QUESTION 1

WHAT ARE THE AREAS OF PARTICULAR SCIENTIFIC OR TECHNOLOGICAL STRENGTH FOR CANADA?

Below are listed broad research disciplines and areas of technological application. Think of these as “gateways” to the various fields with which you have some familiarity. Choose as many as you wish. For each “gateway box” selected you will be presented with a menu of relevant sub-areas that cover the broad area. You should then rate Canada’s standing in all those sub-areas where you are comfortable expressing a view.

Note that you need not be truly expert in a particular area to render an opinion. We are seeking as wide a range of informed opinions as possible. Of course, if you do not feel sufficiently knowledgeable in a particular area, simply leave it blank.

Please note you will also be provided with an opportunity to return to this “gateways” menu (if you wish) at the end of the sub sections you have selected.

BROAD AREAS (“GATEWAYS”) MENU

(Select the broad areas you wish to assess by clicking the relevant boxes, then press the “Continue” button and rate the sub-areas that pop up)

BROAD RESEARCH DISCIPLINES

- Physical, Mathematical and Computer Sciences
- Earth, Ocean, Atmospheric and Space Sciences
- Life Sciences
- Health Sciences
- Engineering
- Social Sciences
- Humanities and the Arts

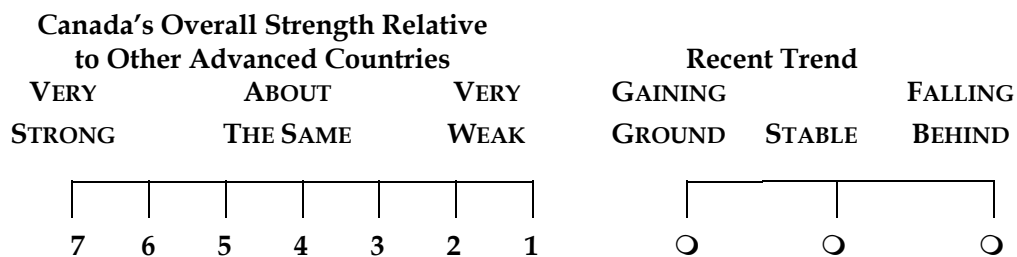
AREAS OF TECHNOLOGICAL APPLICATION

- Information and Communications Technologies (ICT)
- ICT-enabled Services Technologies
- Manufacturing, Construction and Transportation Technologies
- Energy, Mining and Forestry
- Chemicals and Materials Technologies
- Agri-food Technologies
- Environmental Technologies
- Biotechnologies and Medical Technologies
- Nanotechnologies

For each of the following sub-areas for which you are comfortable expressing a view, please first provide your opinion of Canada's current overall strength relative to other advanced countries (i.e., roughly the OECD group.) Please consider both the quality and the extent of the work carried out in Canada.

Second, please rate your opinion of the overall trend in Canada's relative strength over roughly the past five years – are we gaining ground, falling behind, or remaining stable?

Please note, if you do not feel sufficiently knowledgeable to express an opinion about a sub area, please leave it blank.



Q1.EQ.1

Physical, Mathematical & Computer Sciences

SUB-AREAS

- Chemistry - Analytical
- Chemistry - Physical
- Chemistry - Inorganic
- Chemistry - Organic
- Chemistry - Polymer
- Computers - Artificial Intelligence, Robotics
- Computer Software Development & Theory
- Computer Databases, Information Systems
- Computer - Human Interfaces
- Computer Hardware(see also Engineering)
- Mathematics - Applied
- Mathematics - Pure
- Mathematical Statistics
- Physics - Astronomy, Astrophysics, Cosmology
- Physics - Condensed Matter
- Physics - Elementary Particles
- Physics - Nuclear
- Physics - Optical; Laser
- Physics - Plasma
- Physics - Quantum Informatics
- Nanoscale Physical Science
- Other

Q1.EQ.2

Earth, Ocean, Atmospheric & Space Sciences

SUB-AREAS

Geology
Geochemistry & Geochronology
Geophysics & Seismology
Hydrology
Oceanography
Climate Science
Meteorology
Physical Geography, Remote Sensing
Soil Science
Space Science
Other

Q1.EQ.3

Life Sciences (See also Health Sciences in BROAD AREAS ("GATEWAYS") MENU)

SUB-AREAS

Genetics, Genomics & Proteomics
Biochemistry
Cell Biology
Microbiology
Plant Biology
Animal Biology
Systems Biology & Bioinformatics
Ecology & Evolutionary Biology
Physiology
Kinesiology
Neurobiology / Neurosciences
Experimental Psychology
Nanoscale Biosciences
Other

Q1.EQ.4

Health Sciences (See also Life Sciences in BROAD AREAS (“GATEWAYS”) MENU)

Note that the majority of the sub-areas below are the focus areas of individual CIHR Institutes.

SUB-AREAS

Aboriginal Health
Aging
Cancer Research (including cancer control)
Circulatory & Respiratory Health
Clinical Research (cross-cutting)
Dental Science
Gender & Health
Genetics (see also Life Sciences)
Global Health (i.e. issues of health and care in developing countries)
Health Services & Policy
Human Development, Child & Youth Health
Infection & Immunity (including pandemic processes)
Musculoskeletal Health & Arthritis
Nanomedicine and Regenerative Medicine
Neurosciences, Mental Health, Addiction
Nursing Science
Nutrition, Metabolism & Diabetes
Population & Public Health
Veterinary Science
Other

Q1.EQ.5

Engineering

(This section addresses research in Engineering. Aspects of technological application of engineering are addressed under Areas of Technological Application listed in the BROAD AREAS (“GATEWAYS”) MENU).

SUB-AREAS

Aerospace Engineering
Automotive Engineering
Other Mechanical Engineering
Civil Engineering
Industrial Engineering
Petroleum Engineering & Polymer Science
Other Chemical Engineering
Mining Engineering & Mineral Processing
Agricultural Engineering
Forestry Engineering
Environmental Engineering

Biomedical Engineering
Electronic & Photonic Engineering
Computer Engineering (e.g. hardware, systems, architecture)
Communications and Network Engineering
Electrical Engineering (e.g. power systems)
Nuclear Engineering
Materials Engineering and Sciences
Architecture
Other

Q1.EQ.6

Social Sciences (See also Health Sciences in BROAD AREAS (“GATEWAYS”) MENU)

SUB-AREAS

Anthropology
Business and Management Science
Communications, Media & Cultural Sciences
Economics
Education
Geography; Urban & Environmental Planning
Political Science & Public Administration
Law & Criminology
Social Psychology (‘Experimental Psychology’ is included under Life Sciences)
Linguistics
Sociology
Demography
Other

Q1.EQ.7

Humanities and the Arts

SUB-AREAS

Architecture
Archaeology
Classics: Ancient & Medieval Studies
Visual & Creative Arts
History
Humanities “Computing”
Library & Archive Science
Language & Literature
Philosophy
Religious Studies
Other

For each of the following sub-areas for which you are comfortable expressing a view, please provide your opinion of Canada’s overall strength relative to other advanced countries (i.e., roughly the OECD group). When rating these areas of technological application, please first consider, in combination: (a) how close Canadian performance is to the frontier of global best practice; (b) how extensively (relative to international peers) is the technology represented in Canada; and where applicable, (c) how competitive are Canadian-based suppliers in world markets.

Second, please rate your opinion of the overall trend in Canada’s relative strength over roughly the past five years – are we gaining ground, falling behind, or remaining stable?

Please note, if you do not feel sufficiently knowledgeable to express an opinion about a sub area, please leave it blank.

Canada’s Overall Strength Relative to Other Advanced Countries						Recent Trend			
VERY STRONG		ABOUT THE SAME		VERY WEAK		GAINING GROUND	STABLE	FALLING BEHIND	
7	6	5	4	3	2	1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q1.EQ.9

Information & Communications Technologies (ICT)

(See also ICT-enabled Services Technologies in BROAD AREAS (“GATEWAYS”) MENU)

SUB-AREAS

- Microelectronics Components and Systems
- Computer and Related Equipment (design, production)
- Software Development (general)
- Data Systems - Architecture, Processing, Security
- ICT Systems Engineering
- Robotics, Automation and Artificial Intelligence
- Telecommunication Equipment (design, production)
- Wireless Networks
- Broadband Networks
- Telecommunications Services (as distinct from hardware platforms)
- Satellite-based Systems and Services
- Other

Q1.EQ.10

ICT-enabled Services Technologies

SUB-AREAS

e-Commerce

e-Health Services

e-Government

e-Learning

ICT-enabled Commercial Services (e.g. finance, retailing, law, logistics)

'New Media', Multimedia, Animation and Gaming

Other

Q1.EQ.11

Manufacturing, Construction and Transportation Technologies

(See also BROAD AREAS ("GATEWAYS") MENU, which includes other manufacturing, construction and transportation areas.)

SUB-AREAS

Aerospace Products and Parts

Motor Vehicles and Parts

Shipbuilding

Other Transportation Equipment

Machinery - Electrical

Machinery - Non-electrical

Metal Products (primary and fabricated)

Furniture and Related Products

Clothing

Microfabrication

Building Construction (commercial and residential)

Infrastructure Construction (e.g. transportation; utilities)

Rail Transport Technologies

Road Transport Technologies

Marine Transport Technologies

Air Transport Technologies

Multi-modal Transport Systems and Technologies

Other

Q1.EQ.12

Energy, Mining and Forestry

(See also Environmental Technologies in BROAD AREAS (“GATEWAYS”) MENU)

SUB-AREAS

Conventional Oil and Gas Exploration and Extraction
Offshore Oil and Gas Technologies
Oilsands and Related Production
Other Non-conventional Hydrocarbons (e.g. coal bed methane)
Pipelines
Hydrocarbon Refining
Nuclear Power
Hydroelectric Power
Electricity Distribution Technologies (e.g. grid design and management)
Mining Exploration Technologies
Mineral Extraction and Primary Processing
Technologies for Resource Production in Cold Climates
Timber Harvesting Technologies
Forest Conservation Technologies / Methods
Sawmills and Other Primary Processing
Other

Q1.EQ.13

Chemical and Materials Technologies

(See also Biotechnologies and Nanotechnologies in BROAD AREAS (“GATEWAYS”) MENU))

SUB-AREAS

Advanced Industrial Materials (e.g. ceramics, coatings, composites)
Catalytic Process Technologies
Polymer Synthesis & Fabrication; Plastics
Advanced Textiles
Steel-making Technologies
Aluminium Production Technologies
Pulp & Paper
Printing Technologies
Other

Q1.EQ.14**Agri-Food Technologies**

(See also Biotechnologies in BROAD AREAS (“GATEWAYS”) MENU)

SUB-AREAS

Aquaculture

Fish Harvesting & Processing Technologies

Agricultural Machinery

Agro-Chemical Technologies (e.g. fertilizers, pesticides)

Food Transportation, Storage and Marketing Technologies

Food Processing Technologies

New Food Development & Food Biotechnologies

Food Safety Assurance Technologies

Other

Q1.EQ.15**Environmental Technologies**

(See also Energy, Mining and Forestry and Biotechnologies in BROAD AREAS (“GATEWAYS”) MENU)

SUB-AREAS

Smart Energy & Conservation Technologies (e.g. grid management; metering)

Energy Cogeneration

“Clean” Hydrocarbon Technologies (including CO₂ sequestration)

Wind Power

Biofuels

Solar Power

Fuel Cell & Hydrogen Technologies

Cold Climate Building and Construction Technologies

“Green Building” Technologies

Clean Water Technologies

Clean Air Technologies

Solid Waste Management Technologies

Recycling & Recovery Technologies

Environmental Monitoring Technologies & Systems

Other

Q1.EQ.16

Biotechnologies & Medical Technologies

(See also Health Sciences, Agri-Food Technologies, Environmental Technologies, and Nanotechnologies in BROAD AREAS (“GATEWAYS”) MENU)

SUB-AREAS

Pharmaceutical Development

Stem-cell Therapeutic Technologies

Medical Imaging Technologies

Other Medical Devices

Plant Biotechnologies

Animal Biotechnologies (non-human)

Genomic and Proteomic Technologies (general)

Industrial & Environmental Biotechnology (e.g. bio-based products other than food and medicine)

Bioinformatics

Other

Q1.EQ.17

Nanotechnologies

SUB-AREAS

Nanotechnology related to Electronics, Photonics

Nanomaterials Technologies

Nanostructures and Nanofabrication Technologies

Nanobiotechnology and Biomimetic Materials

Medical Nanotechnologies

Other

Would you like to return to the Broad Areas (“GATEWAYS”) to select other areas to assess?

If you do choose to select other areas, please note that you may see the sub areas you have already assessed (and you can just press the “Continue” button (as needed) until you get to the new sub-areas you have selected)

- Yes
- No

QUESTION 2

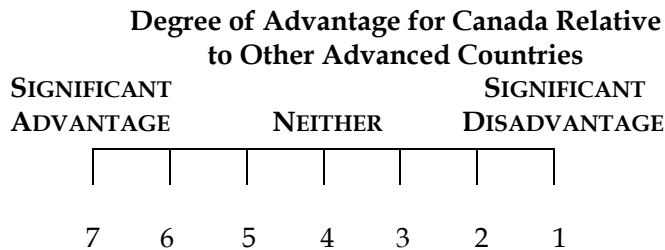
WHICH ELEMENTS OF CANADA'S S&T INFRASTRUCTURE CONFER SIGNIFICANT ADVANTAGES?

The following list includes both "soft" infrastructure (e.g. networks; government programs) and "hard" infrastructure (e.g. major research facilities).

For those elements where you are comfortable expressing a view, please rate your opinion of the degree of advantage they provide for Canadian research and/or technological application relative to other advanced countries (i.e., roughly the OECD group).

You should consider in combination: (a) how close the specific infrastructure is to global best practice (i.e. the quality element); and, where applicable, (b) the extent of deployment of the infrastructure in Canada relative to deployment in other advanced countries (i.e. the "extent of use" element).

Please note, if you do not feel sufficiently knowledgeable to express an opinion about a particular element, please leave it blank.



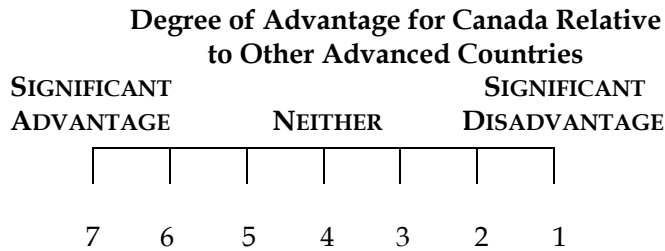
Knowledge Production and Support

Canada's Universities
Canada's Community Colleges
Research Hospitals
Natural Sciences & Engineering Research Council (NSERC)
Social Sciences & Humanities Research Council (SSHRC)
Canadian Institutes of Health Research (CIHR)
Provincial Research Support Programs
Charitable Support for Research
Canada Foundation for Innovation
Canada Research Chairs
Canadian Institute for Advanced Research (CIAR)
CANARIE High-speed Network
High Performance Computing Networks
Canadian Research Knowledge Network (CRKN)
StatsCan/SSHRC Research Data Centres
National Library and Archives

WHICH ELEMENTS OF CANADA’S S&T INFRASTRUCTURE CONFER SIGNIFICANT ADVANTAGES?

For the following elements where you are comfortable expressing a view, please rate your opinion of the degree of advantage they provide for Canadian research and/or technological application relative to other advanced countries (i.e., roughly the OECD group).

Please note, if you do not feel sufficiently knowledgeable to express an opinion about a particular element, please leave it blank.



“Big Science” Facilities

- TRIUMF (UBC)
- Sudbury Neutrino Observatory (SNO)
- Canadian Light Source (Saskatoon)
- Astronomical Observatories
- Canadian Research Icebreaker (Amundsen)

WHICH ELEMENTS OF CANADA’S S&T INFRASTRUCTURE CONFER SIGNIFICANT ADVANTAGES?

For the following elements where you are comfortable expressing a view, please rate your opinion of the degree of advantage they provide for Canadian research and/or technological application relative to other advanced countries (i.e., roughly the OECD group).

Please note, if you do not feel sufficiently knowledgeable to express an opinion about a particular element, please leave it blank.

S&T Commercialization/Translation and Support

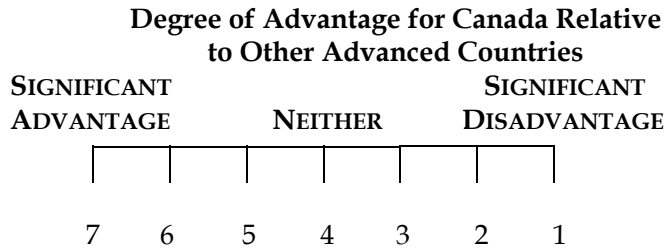
- SR & ED Tax Credit
- University Technology Transfer
- Venture Capital Providers
- Canada’s Banking System
- Business Development Corporation (BDC)
- Export Development Corporation (EDC)
- Canadian Commercial Corporation (CCC)
- S&T Counsellors (International Trade Canada)

NRC's Industrial Research Assistance Program (IRAP)
 Federal Support Programs for Technology-intensive Business (e.g. TPC; Regional Agencies)
 Provincial Government Support Programs for Technology-intensive Business
 Provincial Research Councils
 Genome Canada and Regional Centres
 Sustainable Development Technologies Canada
 International Development Research Centre (IDRC)
 Networks of Centres of Excellence

WHICH ELEMENTS OF CANADA'S S&T INFRASTRUCTURE CONFER SIGNIFICANT ADVANTAGES?

For the following elements where you are comfortable expressing a view, please rate your opinion of the degree of advantage they provide for Canadian research and/or technological application relative to other advanced countries (i.e., roughly the OECD group).

Please note, if you do not feel sufficiently knowledgeable to express an opinion about a particular element, please leave it blank.



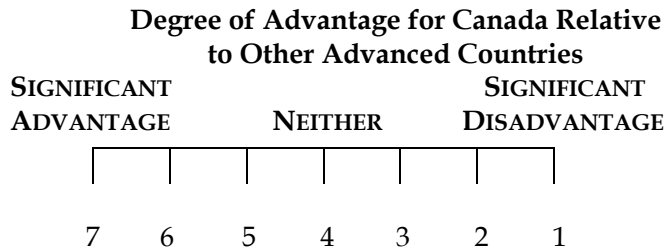
Other Federal S&T Infrastructure

NRC Institutes and Federal Laboratories & Facilities
 Infectious Diseases Laboratories
 Canadian Neutron Beam Centre
 NRU Reactor (AECL)
 NRC Wind Tunnels
 NRC Ocean Engineering Facilities
 Statistics Canada

WHICH ELEMENTS OF CANADA’S S&T INFRASTRUCTURE CONFER SIGNIFICANT ADVANTAGES?

For the following elements where you are comfortable expressing a view, please rate your opinion of the degree of advantage they provide for Canadian research and/or technological application relative to other advanced countries (i.e., roughly the OECD group).

Please note, if you do not feel sufficiently knowledgeable to express an opinion about a particular element, please leave it blank.

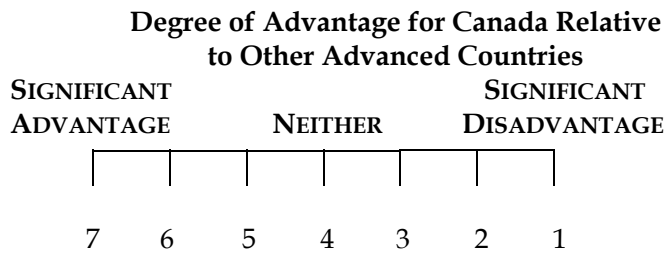


Regulatory System

- Intellectual Property Protection (e.g. patents, copyright)
- Environmental Regulation
- Health and Safety Regulation
- Business Framework Regulations (e.g. start-up; bankruptcy)

WHICH ELEMENTS OF CANADA’S S&T INFRASTRUCTURE CONFER SIGNIFICANT ADVANTAGES?

Are there any other areas where Canadian S&T infrastructure confers significant advantages or disadvantages?



- Other _____
- Other _____
- Other _____
- Don't know/No response

QUESTION 3

WHAT ARE EMERGING AREAS OF POTENTIALLY SIGNIFICANT STRENGTH FOR CANADA?

The following often have been identified as areas of research or technological application that are likely to be of increasing significance over the next 10-15 years. Please choose from the list below (augmented by any you may wish to add) the TOP FIVE areas where you believe Canada is best-placed to be among the global leaders in development and/or application.

- Clean fossil fuel technologies; CO2 sequestration; etc.
- Clean renewable energy wind, biofuels, etc.
- Energy recovery technologies e.g. oil sands; gas hydrates
- Fuel cells and the hydrogen economy
- Next generation nuclear technologies for medical, energy and materials science applications
- Improved diagnostic and surgical methods
- Genetically "customized" health care
- Drug delivery targeted to specific tumours or pathogens
- Tissue engineering (including stem cells, etc.)
- Rapid assays to detect specific biological substances (including pathogens)
- Advanced bio-based materials
- Genetically modified crops
- Filters and catalysts for water purification
- Sustainable development and the extractive industries
- Green manufacturing
- High performance computing
- Ubiquitous radio-frequency identification (RFID) tagging of products
- Public and personal security technologies
- Quantum cryptography for secure information transfer

Other? (Please list, but do not identify more than five items in total, including those you have checked from the list above)

- Don't Know/No response

QUESTION 4

HOW WOULD YOU SUM UP CANADA'S OVERALL S&T CAPABILITY?

Taking into account all aspects of S&T – knowledge generation and application; supporting infrastructure; and positioning for the future – what is your opinion of Canada's current overall strength in S&T relative to other advanced countries? Please also rate your opinion of the overall trend in Canada's relative strength over roughly the past five years - are we gaining ground, falling behind, or remaining stable?

Canada's Overall Strength Relative to Other Advanced Countries						Recent Trend		
VERY STRONG		ABOUT THE SAME		VERY WEAK		GAINING GROUND	STABLE	FALLING BEHIND
						○	○	○
7	6	5	4	3	2			

QUESTION 5

CANADA'S S&T STRENGTHS, IN YOUR OWN WORDS

Please use this space, if you wish, to comment on any aspects of Canada's S&T capabilities – existing or prospective – and particularly on matters that may not have been reflected adequately in the questionnaire.

For example, you may wish to identify emerging areas of interdisciplinary work that are particularly important for Canada. Or, you may wish to comment on Canada's strengths (or weaknesses) in translating research into commercial application. Or, you may wish to comment on particular regional strengths and specific clusters of S&T capabilities.

(Your comments will not be attributed to you, but anonymous excerpts might be included in our report.)

- Comments
- No comments

QUESTION 6

Your affiliation(s)

(Please check as many boxes as apply. Click twice to erase if necessary)

Fellow of the Royal Society of Canada

- Academy of Arts and Humanities
- Academy of Social Sciences
- Academy of Science

- Fellow of the Canadian Academy of Engineering
- Fellow of the Canadian Academy of Health Sciences
- University or College Administrator (President, VP Research or equivalent, University-Industry Liaison)
- Canada Research Chair
- Networks of Centres of Excellence
- Canadian Institute for Advanced Research Program Member
- Other Faculty from a University or College

Senior Employee of a Business Corporation (including commercial Crown Corporations)

- Small business (under 20 full-time employees)
- Medium business (20-99 employees)
- Medium-Large business (100-500 employees)
- Large business (over 500 employees)

- Senior Representative of an Industry Association
- Recipient of technology development funding (e.g. Industry Research Chair; Collaborative Research Development Grant)
- Officer of IRAP or Technology Partnerships Canada
- Senior Executive in Federal Government or Government-Sponsored Entity (ADM, Chief Scientist, Director General, Foundation Executive)
- Representative of a Provincial Government (or Affiliated Entity)
- Other Federal Government (or Affiliate) Employee
- Current Member of a Federal or Provincial (S&T-Related) External Advisory Body or Board

- Senior Representative of a "Think Tank" (i.e. Policy-Advisory NGO)
- Member of the International Development Community (S&T-related)
- Member of another S&T-related Non-Governmental Organization
- Shad Valley Alumnus
- Other (Please specify)
- No response

QUESTION 7

Please indicate where you normally work.

- British Columbia
 - Alberta
 - Saskatchewan
 - Manitoba
 - Ontario
 - Quebec
 - Nova Scotia
 - New Brunswick
 - Prince Edward Island
 - Newfoundland & Labrador
 - Yukon
 - North West Territories
 - Nunavut
 - Outside Canada (Please specify country)
-
- No response

QUESTION 8

Your Age?

(Please specify range)

- Under 35 years
- 35 44 years
- 45 54 years
- 55 years or older
- No response

Thank you for taking the time to complete this survey.

The Council's report to the Government of Canada will be made public on our website in early September.

