

**OECD SCIENCE, TECHNOLOGY AND INDUSTRY OUTLOOK 2004  
COUNTRY RESPONSE TO POLICY QUESTIONNAIRE**

**CANADA**

**1. General Framework and Trends in Science, Technology and Innovation Policy**

Canada's decentralized S&T system presently stands seventh among the OECD economies in terms of our total Gross Expenditures on Research and Development (GERD)<sup>1</sup>, at \$22,450 billion (preliminary 2003 data). In terms of GERD as a percentage of our Gross Domestic Product (GDP), Canada is at 1.88% (2002 data).

In 2001, the Government set an objective of Canada becoming one of the top five countries for research and development (R&D) by 2010. Reaching this objective requires large-scale increases in R&D expenditures by all key players in Canada's S&T sector – industry, universities, and governments.

In February 2002, Canada launched its Innovation Strategy with the release of two key documents – *Achieving Excellence* and *Knowledge Matters*. After extensive consultations with Canadians, a National Summit on Innovation and Learning in November, 2002 identified a variety of priorities for action.

The 2003 Budget incorporated many key ideas from the *National Summit Action Plan*. Building on over \$11 billion in new investments in R&D and innovation since 1998, Budget 2003 initiatives included,

\$1.7 billion in new funds over 3 years for R&D; including:

- \$125 million/year addition to the budgets of the university research granting councils;
- \$225 million/year to universities and hospitals for their indirect costs of federally-supported R&D;
- \$500 million for the Canada Foundation for Innovation for state-of-the-art health research facilities and new diagnostic equipment for research hospitals;
- \$75 million to Genome Canada for health genomics R&D;
- \$105 million/year to the new Canada Graduate Scholarships Program (ramping up over four years);

\$285 million to improve skills and learning for Canadians (including a \$100 million of new funds to establish Canadian Learning Institute); and,

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<sup>1</sup> *Science and Technology Data*, Government of Canada, Innovation Policy Branch, Industry Canada. <http://innovation.gc.ca/s-tinfo>

\$3 billion to promote sustainable development and a healthier environment.

On February 2, 2004, in the Speech from the Throne, the government announced the goal of Canada becoming a world leader in developing and applying the path-breaking technologies of the 21st century - biotechnology, environmental technology, information and communications technologies, health technologies, and nanotechnology. The government also announced that more will be done to ensure that our investment in new knowledge will be converted to commercial success. The government indicated that its long-term goal is that no less than 5% of our R&D investment should eventually be devoted to the development of strengthened knowledge-based assistance for the developing economies.

The government also indicated that it will take steps to promote the development of value-added industries in the resource and agriculture sectors and that it will undertake a comprehensive assessment of federal support for research and development.

## **2. Public Sector Research and Public Research Organizations**

### ***2.1 Major Policy Changes Related to R&D Performed by Universities and Government Laboratories.***

Overall public funding for R&D is estimated at \$5,481 million in 2003-2004, an increase of 8.7% from 2002-2003 to 2003-2004. This increase was driven largely by increases to university research covering direct costs of research, equipment grants, infrastructure, research chairs and new payments for the indirect costs generated by federal support for university research. Intramural spending (within federal departments and agencies) has not changed significantly in the last year. Since 1995, spending on R&D as a percentage of total budgetary main estimates (planned government spending), has increased steadily from just over 2% to just over 3%.

Spending on higher education R&D is expected to continue to increase at a faster pace than within government departments and agencies. This is shifting the balance of funding towards the higher education sector. Forty percent of the government spending on R&D was for intramural activities in 2003-2004, down from 53% in the mid 1990s. The share going to higher education has increased from 23% in the mid 1990s to 37% in 2003-2004.

In both the December 2001 and in the February 2003 Budgets, the annual budgets of Canada's university research granting agencies were increased. Specifically in 2001, the budgets of the Natural Sciences and Engineering Research Council (NSERC) and of the Social Sciences and Humanities Research Council (SSHRC) were increased by 7 per cent each, resulting in an additional \$36.5 million/year for NSERC and \$9.5 million/year for SSHRC. The 2001 Budget also provided a \$75-million/year increase to the annual budget of the Canadian Institutes of Health Research (CIHR). In February 2003, the government increased its support for the three granting councils – NSERC, SSHRC, and CIHR by \$125 million/year. Support for these councils has increased each year since 1998, bringing their combined annual budgets to approximately \$1.3 billion in 2002-03. This represents a 70 per cent increase since 1997-98.

Budget 2003 also created the Canada Graduate Scholarship (CGS) Program. The CGS will have an annual budget of \$105 million when fully implemented in 2006. At that time the CGS will support 2,000 master's and 2,000 doctoral students each year and will increase the number of graduate scholarships supported by the federal government by 70 per cent to almost 10,000. Funding for the CGS has been allocated to the three granting councils in proportion to the distribution of the graduate student community: 60 per cent to SSHRC, 30 per cent to NSERC and 10 per cent to CIHR.

In 2001 the federal government provided a one-time payment of \$200 million through the granting

councils to support the indirect costs associated with federally sponsored research (i.e. those central administrative costs that institutions incur to support federally-funded research but that are not attributable to specific research projects). Budget 2003 provided permanent funding of \$225 million/year beginning in 2003-04 to assist with these costs at universities, colleges and research hospitals. Prior to these investments, the Government of Canada did not support indirect costs.

The 2003 Budget provided an additional \$500 million to the Canada Foundation for Innovation (CFI). An independent not-for-profit corporation created by the Government of Canada, the Canada Foundation for Innovation's goal is to strengthen the capability of Canadian universities, colleges, research hospitals, and other not-for-profit institutions to perform research and technology development by investing in research infrastructure at these institutions. The federal government has invested a total of \$3.65 billion in the CFI since its creation in 1997.

The purpose of this latest investment in the CFI is to create the Research Hospital Fund (RHF). The RHF, which was established as a result of the 2003 Accord on Health Care Renewal with the provinces, will address the need for further investment in research hospital infrastructure, especially for new and different research space that will make it possible to take full advantage of state-of-the-art equipment, innovative ways of doing research and the hospitals' increased research capacity as a result of hiring additional highly qualified personnel. Of particular interest are those large-scale infrastructure projects that take a more integrated and multi-disciplinary approach to health research – biomedical, clinical, health services and population health research. These projects will have significant research infrastructure needs, especially research-related space requirements beyond what is normally supported by the CFI.

On January 30, 2002, the then Industry Minister, Allan Rock, and Dr. David Strangway, President and CEO of the CFI, announced \$779.2 million in funding to support over 280 projects involving over 70 universities, colleges, hospitals, and not-for-profit research institutions. The \$779.2 million investment is leveraging a further \$899.2 million from the provinces, business and voluntary organizations.

## ***2.2 Major Initiatives to Reform the Organization and Governance of Universities and Public Research Organizations.***

Major changes were made to the governance structure for science in Canada in December 2003 with the creation of two new positions in the government and the elimination of one. First, a Parliamentary Secretary to the Prime Minister with emphasis on Science and Small Business was created. The Parliamentary Secretary will provide the Prime Minister and the government with assistance and advice concerning the full range of science-related issues. In a change from past practice, Parliamentary Secretaries have been made members of the Privy Council, which gives them a seat in Cabinet and a greater role in the government.

The second change was the creation of the position of a National Science Advisor to Canada's Prime Minister. The Advisor's role will be to strengthen and enhance the quality of science advice to the Government. With the creation of these two positions, the position of Secretary of State, Science, Research and Development, a junior Minister under the Minister of Industry, was eliminated.

Canadian federal government departments and agencies are exploring a fundamental shift in the way they collaborate and cooperate on science and technology related to shared mandates and/or key public policy issues. Through an Assistant Deputy Minister-level interdepartmental committee (The ADM S&T Integration Board), departments and agencies are identifying key subject areas on which they have common interests and are developing shared workplans. These workplans involve the participants reallocating existing resources to joint initiatives that have shared management and decision-making.

The ADM S&T Integration Board plays a facilitation role, raising awareness of needs and opportunities for collaboration, promoting selection of priorities, bringing together interested parties, and identifying and breaking down barriers to collaboration. Projects under the Integration Board do not specifically require participation by non-government partners, but as it is their objective to focus the best available expertise on each issue, they encourage and welcome participation by universities, research institutes, and the private sector.

In 2002, the federal government and the Association of Universities and Colleges of Canada signed the Framework of Agreed Principles on Federally-Funded University Research. The Framework, signed at Canada's Innovation Summit in November, 2002, commits universities to doubling their research outputs and tripling their commercialization performance by 2010. In return, the federal government committed to providing universities with adequate research funding, including funding for the indirect costs of research.

There have been no major changes in the institutional mechanisms for priority setting within federal research laboratories since the last STI Outlook report.

### ***2.3 Major Policies and Government-Sponsored Programs to Foster International Collaboration among Researchers in Universities and Public Research Organizations***

The Canada Foundation for Innovation has two funds dedicated to support research collaboration with international partners. One is the International Joint Venture Fund (allocated \$100 million), which enables the establishment, in Canada, of high profile research infrastructure projects aimed at taking advantage of unique research opportunities with leading facilities in other countries. The other is the International Access Fund, which supports Canadian institutions and researchers in accessing major international collaborative programs and facilities in other countries.

The CFI is presently proceeding with 9 international projects, which have been allocated a total of \$165.6 million. Examples of projects approved include:

- \$38.9 million to transform and expand the existing Sudbury Neutrino Observatory into a permanent research facility;
- \$62.4 million to develop NEPTUNE – the world's largest cable-linked seafloor observatory off North America's west coast; and
- \$27.7 million to retrofit an icebreaker, turning it into a unique world-class travelling Arctic research laboratory.

## **3. Government Support for Private Sector R&D and Innovation**

### ***3.1 Major Policy Changes in the Individual Instruments (e.g. taxes) Used to Provide Public Support for Private Sector R&D and Innovation.***

The government has pursued a consistent policy of reducing the tax burden on both businesses and individuals. A tax reduction plan, which would save taxpayers approximately \$100 billion over five years, was implemented in 1999. In the last two Budgets, in 2001 and 2003, a number of key measures were introduced that will have specific beneficial impacts on technology-based businesses, particularly, small and medium-sized businesses (SMEs). These measures include:

- The amount of income subject to the 12% small business tax rate has been increased from \$200,000 to \$300,000 over four years;
- The threshold for access to enhanced Scientific Research and Experimental Development tax

credits has been lowered;

- The tax-free rollover for capital gains on small business investments has been enhanced (making investment or reinvestment in new opportunities more advantageous).
- The federal capital tax, known as the Large Corporation Tax, is being phased out over five years to 2008, eliminating it completely for medium-sized corporations by 2004.
- The range of renewable energy and energy efficiency equipment that was eligible for an accelerated tax write-off has been considerably expanded. In addition, federal excise tax exemptions for the ethanol or methanol portion of blended diesel and bio-diesel fuels have been put into effect.

### ***3.2 Major Changes in the Balance and/or Priority of Public Support for Business R&D and Innovation.***

The December 2001 Budget allocated \$110 million to build CA\*net 4, a new generation of Internet broadband network architecture that will link all research-intensive institutions, including many community colleges.

There was also an allocation of \$110 million over three years for leading-edge technologies and to expand the National Research Council's (NRC) regional innovation initiative. This is specifically directed to: the support of a National Institute for Nanotechnology in Alberta; the Advanced Aluminium Technology Centre in Quebec; a new research program at the Plant Biotechnology Institute in Saskatoon entitled *Crops for Enhanced Human Health*; and enhanced funding for support of fuel cell research in British Columbia. These allocations were further supported by the provision of \$10 million in new annual funding to establish the Sustainable Urban Infrastructure Innovation Centre in Regina, Saskatchewan, and the Bioactives for Human and Marine Health Innovation Centre in Charlottetown, Prince Edward Island. Some of this funding will also be used for Industrial Partnership facilities.

An initiative announced in the February 2003 budget was the Medical and Related Sciences (MaRS) project. This initiative was founded by leaders from Canada's academic, business and scientific communities to fuel the commercialization of medical research. MaRS will encompass the full spectrum of innovation in the medical and related sciences, from a sophisticated discovery centre to extensive incubator facilities for small and medium-sized companies. It will also serve as the nucleus of a virtual network of discovery linking other universities and research hospitals. Consistent with the government's focus on improving health research infrastructure and supporting commercialization, it has contributed \$20 million to the MaRS project.

The February 2003 Budget provided for a permanent funding increase of \$25 million per year to the Industrial Research Assistance Program (IRAP) of the National Research Council. IRAP provides industrial technology assistance to Canadian SMEs. It has some 260 Industrial Technology Advisors, located in 90 communities across Canada, who work with approximately 12,000 small and medium-sized firms a year, helping clients to tap into sources of specialized expertise that can resolve a broad variety of technology-related business problems.

In June, 2003, the government announced that the National Research Council (NRC) has committed more than \$50 million over five years to support Canada's astronomy and astrophysics research programs. One of the key elements in this commitment is support for a Canada-US North American Program in Radio Astronomy, which will offer Canadians access to the radio astronomy facilities of the US National Radio Astronomy Observatory (NRAO). As part of this arrangement, Canada will construct a next generation digital correlation system in NRAO's New Mexico facility, as part of a project to create a uniquely advanced radio observatory. The Canadian portion of this project will be managed by NRC's Victoria-

based Herzberg Institute of Astrophysics.

Another S&T initiative is the establishment of a new Canadian Photonics Fabrication Centre in Ottawa. This project, which will contribute to the development of a world-class photonics technology sector, received a total of \$30 million from the federal government.

The Business Development Bank of Canada (BDC) has invested in hundreds of companies and has been through the full venture capital cycle of seeding, nurturing, and harvesting numerous times. In 2003, the BDC venture capital portfolio stood at over \$430 million, with an objective over the next 5 years of reaching the \$1 billion mark. In the February 2003 Budget, the government made an additional investment of \$190 million in BDC to provide additional equity financing for knowledge-based and export-oriented businesses, and to increase the financing available to women entrepreneurs.

#### **4. Enhancing Collaboration and Networking among Innovating Organizations**

##### **4.1 Major Initiatives to Promote Collaboration and Networking among Private Firms**

No new initiatives have been undertaken in this area in the 2002 – 2004 time period.

##### **4.2 Major Policy Initiatives to Promote Stronger Industry-Science Relations**

Canada's National Research Council (NRC) is taking a key role in strengthening Canada's system of innovation on the basis of local strengths while leveraging NRC's national and international capabilities and partnerships. Specifically, the NRC is working to strengthen linkages between its research labs and local industry by promoting and sponsoring community-level meetings and workshops to allow regional stakeholders to define the existing and potential local technology base and to identify local strengths and weaknesses in the areas of business, financing, research, and infrastructure. In addition to reinforcing existing partnerships, these small gatherings provide an opportunity to establish local and national networks.

#### **5. Human Resources for S&T**

##### **5.1 Recent Statistics on Science and Engineering Graduates from Universities.**

Below is a summary table of the university degrees granted in Canada in 2000 (latest available data).

<b>Discipline</b>	<b>Bachelor and First Professional Degree</b>	<b>Master's</b>	<b>Doctorate</b>	<b>All Degrees</b>
All Fields	128000	23987	3773	155760
Arts & Science	4169	115	52	4336
Agricultural & Biological Sciences	10283	1089	477	11849
Education	20779	3624	378	24781
Engineering and Applied Sciences	9831	2277	569	12677
Fine & Applied Arts	4367	515	38	4920

Health Professions & Occupations	8527	1567	425	10519
Humanities	14221	2755	453	17429
Mathematical & Physical Sciences	8352	1460	567	10379
Social & Related Sciences	47471	10585	814	58870
<b>Total: Science &amp; Engineering</b>	36993	6393	2038	45424

Source: Statistics Canada

### ***5.2 Policy Initiatives Taken to Address Perceived Shortages of Scientists and Engineers in Particular Fields***

Under Canada's Innovation Strategy, the human resources component, *Knowledge Matters*, set the target of increasing the admission of Master's and PhD students at Canadian universities by an average 5% per year to 2010. The Canada Graduate Scholarships Program will allow 4,000 new graduate students, who are academically qualified, to receive direct support from the federal research granting councils. This Program received permanent funding in the February 2003 Budget of \$105 million/year, when fully phased in over four years.

In order to ensure that health professionals and health system managers are equipped with the necessary skills to assess and apply the growing body of health research, the government has allocated \$25 million, to be used over 10 years, to initiate a training program, to be delivered by the Canadian Health Services Research Foundation.

The February 2003 Budget allocated new funding to modernize and strengthen the Canada Student Loan Program, to improve access to post-secondary education. This initiative received \$60 million over two years.

At the National Summit on Innovation and Learning in November, 2002, the Government announced an intention to develop a Canadian Learning Institute. A key objective of the Institute will be to broaden and deepen data and information on education and learning. The February 2003 Budget allocated a one-time contribution of \$100 million to the establishment of this Institute. This initiative has been re-named the Canadian Council on Learning and is expected to be operational early in 2004/05.

### ***5.3 Policies Related to International Migration and Mobility of Scientific and High-Skilled Personnel.***

In response to concerns from employers regarding delays in the processing of highly-skilled immigrants, the February 2003 Budget provided \$6.6 million over two years to launch a fast track system for skilled workers with a permanent job offer from a Canadian employer.

Budget 2003 also allocated \$41.4 million over 2 years to facilitate the attraction and integration of skilled immigrants into Canada's labour market. This includes an investment of \$14 million over the next two years to work in partnership with provincial and territorial governments, regulatory bodies and employers to facilitate foreign credential assessment and recognition. A further \$10 million will be used as

seed money for delivery of labour market language training to new immigrants.

## **6. Policies to Boost Innovation in the Service Sector**

### ***6.1 Policies to Foster Increased Innovation and Productivity Growth in the Service Sector***

No new initiatives have been undertaken in this area in the 2002 – 2004 time period.

### ***6.2 Statistics on the Participation of Service Sector Firms in Innovation Programs not Specifically Targeted at Service Firms.***

Statistics Canada has launched a Survey of Innovation in 2003. This survey of innovation covers Canadian establishments with at least 15 employees and \$250,000 of gross business income in the selected service industries including selected knowledge-based professional, scientific and technical service industries; all ICT industries; selected natural resource support services; and selected transportation industries. The intent of the survey is to give a new understanding of the innovation activities performed as well as the innovation performance in these selected service industries. Data is expected to be available for May 2004.

## **7. Policy Evaluation**

### ***7.1 Changes in the Evaluation Of Innovation Policy or Institutions***

Budget 2003 introduced accountability measures for publicly funded foundations to ensure that these organizations fulfill the objectives of their respective mandates. These measures require foundations to provide corporate plans, annual reports and regular independent evaluations to the Minister responsible for the funding agreement. Departments are also expected to include significant expected results of foundations in the Departmental Reports on Plans and Priorities and to include any findings from the evaluations in their Departmental Performance Reports. To a large extent, these accountability measures were already present in the funding agreements between the federal government and the S&T related foundations. These measures simply reinforce the government's commitment to ensuring accountability.

### ***7.2 Information about the Outcomes of Recent Major Evaluations of R&D or Innovation Policies.***

On December 12, 2003, the Prime Minister indicated that the government will undertake a comprehensive assessment of federal support for research and development.