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Highlights of Departmental S&T Action Plans in Response to

Science and Technology for the New Century

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Science and Technology for the New Century

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For further information, contact:

Andrei Sulzenko
Executive Director, S&T Review
Industry Canada
235 Queen Street
OTTAWA, Ont.
K1A 0H5
Tel.: (613) 954-8911
Fax: (613) 957-1990

Additional copies of this report are available from:

Distribution Services
Industry Canada
Room 205D, West Tower
235 Queen Street
OTTAWA, Ont.
K1A 0H5
Tel.: (613) 947-7466
Fax: (613) 954-6436

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Introduction

In its policy paper, *Science and Technology for the New Century*, the federal government lays out a number of steps to improve the management of its science and technology investment.

This summary document presents highlights of new S&T directions under way in the federal public service.

The following S&T directions are in response to the new federal Management Framework, which sets out seven operating principles that strongly reflect the advice received through the S&T Review process. Detailed information can be found in the individual S&T Action Plans.

1. Increasing the Effectiveness of Federally Supported Research

A new *Federal Partners in Technology Transfer Initiative* unites 13 departments and agencies to promote the commercialization of technologies transferred to the private sector.

Agriculture and Agri-Food Canada will consolidate its research activities at 18 centres, each a hub with a specialized focus of national importance, with strategic spokes to serve industry across the country. Moreover, Agriculture and Agri-Food Canada is introducing a new study management system for making investment decisions in research within all of its research centres. The process will help identify potential partners for research and encourage their early involvement in technology development, transfer and risk-sharing.

Statistics Canada will create a new S&T information system to measure the country's progress in becoming more innovative and competitive.

A program of technology assessment, foresight, research and commercialization will enable the Industry Portfolio to define investment priorities, in partnership with firms, in two areas: information and telecommunications technologies; and advanced manufacturing technologies.

Environment Canada will establish an external advisory body to provide advice on all research and development being undertaken by the department in order to ensure that it is relevant and has a high potential for yielding valuable benefits.

The challenge of lower research and development (R&D) and capital spending in defence will be to maintain and improve the industrial impact of those expenditures that remain. To this end, the Department of National Defence will work with Industry Canada, as well as Public Works and Government Services Canada, towards harmonizing industrial and defence policies to maintain essential defence industrial capacity.

Health Canada has launched a laboratory rationalization project to increase efficiencies further through measures such as integration or co-location with other laboratories and cost-recovery. As well, the department will be opening the Winnipeg Laboratory to provide Canada, for the first time, with its own capacity to deal with emerging health pathogens that require high-level containment.

Excellence and relevance have always been the cornerstone of Fisheries and Oceans science activities. To ensure these activities respond to

client needs, advisory boards and peer review mechanisms have been activated, including a Fisheries Research Conservation Council and the Institute of Ocean Science Board.

Transport Canada's changed role and core functions will shift the focus of its activities to safety, policy and response to broad national priorities such as the current ones on energy efficiency, environmental management, and accessibility. Transport Canada will continue to contract out most of its research to accelerate technology transfer and stimulate research capability in the private sector.

The National Research Council (NRC) is developing *Regional Technology Centres* around its laboratories in Newfoundland, Nova Scotia, Quebec, Manitoba, Saskatchewan and British Columbia that will offer multi-service access to NRC facilities, S&T information and industrial research assistance.

Both the Medical Research Council (MRC) and Health Canada are evaluating their peer review committees for their capacity to assess proposed projects from the standpoints of scientific productivity and impact on world knowledge, as well as relevance, efficiency and effectiveness. Furthermore, the MRC and Health Canada are working to develop more formal systems to scan the research environment so that key decision makers and experts are aware of the latest developments in various fast-moving areas of health S&T such as gene therapy.

Natural Resources Canada, Treasury Board Secretariat and research partners have initiated a new *R&D Impact Network* to advance R&D impact assessment so that research organizations have simple, credible and broadly accepted performance measurement tools for results-based management and decision making.

Natural Resources Canada, in initial studies, has completed major impact assessments of its mineral and energy technology projects and also the federal Program of Energy Research and Development.

2. Capturing the Benefits of Partnership

The *Health Research Agenda for Canada Initiative* is aimed at helping funders and performers in all sectors (federal, provincial and territorial) ensure their S&T efforts are both essential and complementary to those of others. Health Canada, the MRC and the Social Sciences and Humanities Research Council (SSHRC), in partnership with others, will pursue research activities in such areas as health systems, health determinants and population health, AIDS, breast cancer and genetics.

Agriculture and Agri-Food Canada's *Matching Investment Initiative* encourages further industry investment by providing matching contributions (up to $35 million per year by the year 2000) to collaborative research projects.

The *Technology Partnerships Program* creates partnerships among universities and small and medium-sized enterprises (SMEs) to develop university research to the point where it can be exploited and commercialized by industry. The Natural Sciences and Engineering Research Council (NSERC), SSHRC and the MRC are leading this effort.

The MRC, Industry Canada, the National Cancer Institute of Canada, NSERC and SSHRC are supporting the *Canadian Genome*

Analysis and Technology Program, which will assist in the understanding, treatment and prevention of more than 4000 genetic diseases that afflict humans as well as the multifactorial diseases in which genetic predisposition plays an important role.

In separate partnerships with Western Economic Diversification Canada (WD), the Federal Office of Regional Development (Quebec) (FORD(Q)), and the Atlantic Canada Opportunities Agency (ACOA), the Business Development Bank of Canada delivers commercially-based funding to SMEs, for market development and innovation, particularly in high-risk, knowledge-based industries.

WD is taking a lead role in the establishment of investment funds in co-operation with financial institutions to leverage private sector capital and increase access to capital on commercial terms by SMEs in Western Canada. These funds are targeted at emerging knowledge-based sectors in Western Canada such as biotechnology, health sciences, information technology and environmental industries.

The *Canadian Medical Discoveries Fund,* a venture capital fund inspired by the Medical Research Council, has in just 13 months raised $38.1 million to facilitate the commercialization of federally-funded health research discoveries in Canada.

Through agreements with the three regional federal development agencies and other collaborative instruments with the provinces, the Canadian Space Agency (CSA) is pursuing a strategy aimed at supporting the development of a competitive Canadian space industry on the basis of regional strengths.

The *Networks of Centres of Excellence Program* facilitates the transfer of knowledge and technology from universities to industry. A group of 14 networks stimulate leading-edge fundamental and applied research in emerging areas of critical importance. Recently approved networks include health, environment, advanced materials and technology-based learning. The program is jointly funded by NSERC, SSHRC and MRC, and involves Industry Canada.

NSERC and the CSA are working together in the context of NSERC's *Research Partnerships Program* to develop synergies between university research and the space industry. The CSA also supplements NSERC scholarships awarded to students in space science and engineering.

The recently launched *Mobile Foundry Laboratory Program* of Natural Resources Canada is geared to support the foundry industry by helping improve technical practices and by introducing new technological thrusts. The program is designed to monitor the efficiency of foundry processes.

Expanded interaction with industry contributes to its understanding of the Department of National Defence's long-term defence research interests, and facilitates the transfer of promising technologies to the private sector for commercialization. As well, a more strategic process for collaboration with industry in equipment development integrates in-house expertise with university knowledge and industrial know-how to deliver the maximum overall benefit to DND and the nation.

The NRC/NSERC *Research Partnership Agreement* is a five-year initiative that provides funding for university-based research, research training and research-related activities conducted in partnership with Canadian companies and NRC institutes to generate new knowledge; build linkages among university researchers, industry and government laboratories; transfer research results; and train highly qualified personnel in priority areas.

Western Economic Diversification Canada, Industry Canada and the NRC are working with the four western provinces to prepare a

strategy based on technology clustering opportunities focused on information technology and telecommunications, biotechnology, and advanced manufacturing and materials. An S&T MOU on the co-ordination of S&T initiatives in Western Canada will be signed between the **Industry Portfolio** and the western provinces. In addition, the NRC and ACOA will co-ordinate their innovation interests by focusing on building new industrial capabilities in aquaculture, marine engineering and biotechnology. Furthermore, FORD(Q) signed memoranda of agreement with eight federal departments, and became a key player in the *Canadian Technology Network*, the Info Entrepreneurs Centres and Inno-Centre.

The *Canadian Technology Network (CTN)* provides firms with quick, easy access to expertise, advice and information on technology and strengthens the linkages in Canada's system of innovation. The *CTN* is a partnership among industry associations, research organizations, governments, universities and colleges. The Network is managed by the NRC's *Industrial Research Assistance Program* and Industry Canada.

The *Standards Information System of Canada* makes it easier for companies to acquire technology and participate in the standards-setting process. It involves the Standards Council, in partnership with public and private organizations.

In order to advance the government's jobs and growth agenda, Technology Partnerships Canada has been created by Industry Canada to provide repayable contributions to firms and alliances that develop and commercialize technologies critical for achieving sustainable development and maintaining an internationally competitive industrial base.

3. Emphasizing Preventive Approaches and Sustainable Development

A *Framework for Sustainable Development S&T* in the natural resources (an agreement among Agriculture and Agri-Food Canada, Environment Canada, Fisheries and Oceans and Natural Resources Canada) fosters collaboration and co-ordination, and increases co-operation and working together on specific projects.

Health Canada is undertaking to address research gaps that are critical in managing environmental impacts on health including, as examples, developing test protocols necessary for assessing the infectivity of, toxicity of, and exposure to new biotechnology products and assessing the potential health effects of new substances. Health Canada, with the support of the provinces, is strengthening Canada's health surveillance and analysis capacity. The focus is on priority "blind spots" that relate to some of the highest ranked causes of illness, disability and death in Canada, including, for example, cardiorespiratory illness and sexually transmitted diseases.

In recognition of its environmental stewardship responsibilities, DND is launching R&D efforts for the protection and remediation of the environment. Examples include the development of alternative strategies for training and the formulation of environmentally friendly paints for ships.

Through its own research on Canada's carbon budget and through collaborative efforts such as the Boreal Ecosystem-Atmosphere Study

(BOREAS), Natural Resources Canada contributes to the international study of climate change and its potential effects on boreal forests. Also, in the area of climate change, the department has recently launched the *Voluntary Challenge and Registry Program*, which invites industry participation in reducing national carbon dioxide emissions, a leading cause of climate change.

The Canadian Space Agency, in collaboration with Natural Resources Canada, has concluded arrangements for a joint venture with the private sector to build and commercially operate RADARSAT II. The objective is to develop an internationally competitive Canadian industry in the applications of Earth observation satellite data to improve natural resources management and environmental monitoring.

Transport Canada is placing greater emphasis on research into means of anticipating and preventing transportation accidents. Work is under way to develop a sustainable transportation strategy that embraces the entire transportation sector.

Fisheries and Oceans brings know-how to the private sector and other users. For example, the pilot program of testing integrated electronic navigational systems with a Great Lakes carrier has resulted in their first year ever (1995) without a vessel incident, a 20 percent increase in revenue and a considerable reduction in their insurance costs.

Environment Canada's priority activities for sustainable development reduce risks to the environment and human health, foster green technologies and encourage their wider use in the private sector and in other countries, and encourage Canadians to make the environment an important part of their daily decisions. Actions in support occur in a range of areas including ongoing work in key ecosystems, working with partners to complete new generations of national strategies for managing toxic substances and preventing pollution, major scientific activities giving priority to species at risk, climate change and persistent toxics. Environment Canada will work actively with other departments and agencies to get the federal house in order, by providing guidance in greening operations to all federal departments and helping them to accelerate preparation of their sustainable development strategies.

For Industry Canada and the NRC, continued integration of environmental considerations into programs and developmental activities achieves maximum long-term results — but only if integrated as early as possible into as many programs and activities as possible. For example, part of NRC's new manufacturing technologies program focuses on "clean" process technologies. As well, Industry Canada is providing support for the Canadian automotive industry's development of next generation "clean car" technology.

4. Positioning Canada Competitively Within Emerging International Regulatory, Standards and Intellectual Property Regimes

The *Canadian Calibration Network* gives trading partners confidence that Canada's products are based on a reliable measurement system traceable to international standards. The Network is the result of efforts by the Standards Council of Canada and the NRC.

To reduce the high costs of surveying boundaries for native land-claim settlements, Natural Resources Canada fosters the application of innovative technologies such as the *Global Positioning System (GPS)*, or surveying by satellite. It is developing the *Canadian Active Control System (ACS)* to provide access to accurate, inexpensive ***GPS*** surveys and is looking to an industry consortium to exploit the commercial potential of the ***ACS***.

Refocused research efforts by Agriculture and Agri-Food Canada will provide new, improved and safer products, as well as better technologies for packaging, preservation and distribution.

Automated operations at Industry Canada's Canadian Intellectual Property Office improve client services and provide Canadians with information products that facilitate access to strategic and technological intellectual property information.

A proposed research program into the formal and informal systems for managing intellectual property will ensure Canadian investments in intellectual property are safeguarded. The program is an initiative of SSHRC, Industry Canada, NRC and NSERC.

Health Canada is a major player in the harmonization of technical requirements for drug reviews through its participation in international committees and other fora. This is good business and good health care and ensures a level regulatory playing field for the pharmaceutical industry and timely access to safe and effective drug products.

Fisheries and Oceans has helped develop international initiatives to improve fisheries conservation and protection of the marine environment, for instance the FAO Code of Conduct for Responsible Fishing, UN Convention on Straddling Fish Stocks, and the precautionary principle for conservation and sustainable development.

DND's *Cooperation with Industry (COPWIN) Initiative* informs industry of upcoming requirements and business opportunities.

Environment Canada and environmental industry groups, through a national certification program, will support faster commercialization of numerous technologies, many of which are tested and ready for market.

Natural Resources Canada is rewriting the *Explosives Regulations* in plain language and in client-specific packages. The resulting regulatory framework is expected to be state-of-the-art.

5. Building Information Networks: The Infrastructure of the Knowledge Economy

Industry Canada's initiatives for developing Canada's Information Highway will establish roadways for innovation and determine how information is disseminated within Canada's system of innovation.

The establishment of research networks with a central focus at the relevant research centre will foster alliances between Agriculture and Agri-Food Canada and the agri-food industry and help improve communications among sister centres. For example, the Clonal Gene Bank Network, dedicated to preserving fruit crops, will be set up at the Harrow Research Centre in Ontario.

The five-year pilot *Data Liberation* project will make federal data files more widely available to social scientists. Statistics Canada and SSHRC,

as well as Human Resources Development Canada, the MRC, and the Department of Justice, are involved in the project.

To strengthen the dissemination and use of health S&T information, Health Canada and the MRC are actively pursuing ways to use new communications technologies to facilitate linkages between industry, university and government research and development activities. Related to this is Health Canada's decision to continue to invest funds in strengthening Canada's *Health Intelligence Network*, which is designed to support Canada's ability to track down threats such as drug resistant bacteria and emerging viruses.

The *Green Lane* on the World Wide Web provides a cost-effective way of building on Environment Canada's tradition of excellence in providing meteorological services, health-related warnings and environmental information to individuals and communities across Canada and abroad. The *S&T Home Page* that is being developed will provide information on technology opportunities, newsletters, research and other reports, courses and conferences.

The *DREnet* allows the DND's Research and Development Branch to communicate with its clients and stakeholders in industry and universities via the Internet. This experimental network helps DND investigate the use of wide-area networks for defence research matters.

Transport Canada is championing research related to Intelligent Transportation Systems; the communications aspects of such systems will become part of the fledgling Information Highway.

Partners and clients can now regularly access Natural Resources Canada's geoscientific databases through Internet and dedicated information centres set up in provincial facilities. Geoscience library searches, report, open file and printed map purchases are increasingly made via Internet. Customized geophysical map products can be requested, reviewed and ordered on-line.

As part of its *Service Delivery Network Initiative*, Human Resources Development Canada is testing a number of projects that demonstrate how technology can work to extend and improve service to Canadians. For example, in the Ottawa-Hull area the department is testing the Electronic Labour Exchange (ELE). The ELE is a computer-based pilot project on the Internet that allows employers to match job seekers to employment opportunities. Clients can access this free service from their home, office or at kiosks throughout the area.

In Miramichi, New Brunswick, Human Resources Development Canada, in conjunction with the Atlantic Canada Opportunities Agency and the provincial government, have funded the establishment of a state-of-the-art Learning Centre at the local community college. The Centre, one of the first of its kind in North America, has quickly gained international recognition for producing high technology entrepreneurs who can successfully compete in today's global marketplace.

6. Extending Science and Technology Linkages Internationally

Natural Resources Canada is strengthening its international linkages in order to create and expand markets, improve access to foreign technologies and collaborate on global efforts that

contribute to national priorities. It collaborates on "big science" topics, such as climate change, that require international co-operation to succeed. As one illustration of international co-operation: Canada, the United States and Mexico are harmonizing their wood import regulations and, under the auspices of the North American Forestry Commission, are developing a list of exotic forest pests.

Health Canada recently signed a Memorandum of Co-operation with the United States and Mexico to strengthen mutual co-operation in the scientific and regulatory areas of regulated products including foods, drugs, cosmetics, medical devices and radiation-emitting products.

The Industry Portfolio's pilot projects in international technology monitoring will build competitive strengths in the two strategic research and technology initiatives of advanced manufacturing technologies and information and telecommunications technologies.

Selected international partnerships with countries such as the Netherlands, France and the United States help Agriculture and Agri-Food Canada acquire new scientific and technical knowledge that can be applied to the Canadian agri-food industry.

More focused and intensive efforts with DND's key partners, such as the United States, the United Kingdom, France, the Netherlands and Australia, allow Canada to put forward quality technological expertise and knowledge into co-operative international programs.

The CSA is working with industry to identify market and technology intelligence requirements that could be met from the international partnerships and linkages that form an integral part of the ***Canadian Space Program***, and to improve the gathering and dissemination of such intelligence.

7. Promoting a Stronger Science Culture

Health Portfolio initiatives support the development of a science culture in Canada. For example, the *Eagle Project* provides opportunities for the 63 First Nation communities in the Great Lakes Region to participate in environmental health research. The MRC and Human Resources Development Canada have developed a program that allows unemployed university graduates to upgrade their science knowledge and skills by working in the laboratories of outstanding health scientists. Most participants in a pilot of the program subsequently found relevant employment.

Human Resources Development Canada is helping to fund Industry Canada's *New Media Learning Materials Project*, which is sponsoring a large-scale study of the market potential for certain technology products including computer-based training and interactive videos. The project's goal is to identify how the training needs of Canadian companies and the capabilities of technology producers can be better matched.

Northern Telecom and the SSHRC are jointly funding several projects involving researchers and community partners (teachers, school administrators and policy makers) to study ways to improve science training and increase science literacy.

The CSA's *Space Awareness Program*, working through existing community-based science organizations, promotes the unique appeal of space as a medium for improving scientific literacy in the general public and promoting careers in science and technology.

Fisheries and Oceans and Maritime fishermen have jointly established a Fishermen and Scientists Research Society. This novel approach is changing the way scientists and fishermen interact and learn from each other, leading both to a better understanding of fishery biology and local fish stocks.

SchoolNet, an Industry Canada initiative (supported by the provinces, territories and private sector) to link Canada's 23 000 schools, libraries and universities to the Internet by 1998, will yield major dividends in student performance and the job-market. For example, the *Electronic Innovators Program* connects classrooms with more than 400 professionals around the world.

Environment Canada will continue to reach out to Canadians to encourage them to make the environment an important part of their daily decisions. The *1996 State of the Environment Report* will be available electronically on the Internet and on CD-ROM and, for the first time, will give Canadians the ability to access and manipulate data on ecosystems of interest to them.

Natural Resources Canada carries out a range of projects and activities to reach out to the community, particularly students, and to communicate the importance of S&T in the natural resources sector. As one example the department supplements scholarships provided by the NSERC to encourage forestry graduates to link and work with scientists and to conduct part of their thesis research in federal laboratories.

Managing Better

An initiative to develop and implement on a pilot basis an improved S&T management framework, led by Natural Resources Canada, emphasizes greater client focus, more effective and responsive accountability, and enhanced S&T management.

A new management structure for Environment Canada's S&T efforts includes an Executive Committee of their S&T Assistant Deputy Ministers supported by committees bringing together senior S&T managers to better integrate S&T efforts.

Under the umbrella of *Operation Excelerate*, the Research and Development Branch of DND has re-engineered its program to make it more client focused and responsive.

A new management framework for the Industry Portfolio ensures a co-ordinated approach to the development of plans and strategies for science, technology and innovation by considering strategic issues and initiatives, exchanging information and overseeing the co-ordination of shared goals.

Few countries have brought together fisheries science, oceans science, fisheries management and marine services into one coherent organization. The recent merger of Fisheries and Oceans and the Canada Coast Guard, the new *Canada Oceans Act*, and a new partner-based approach provide Canada with a unique combination of tools to manage our renewable marine resources wisely and responsibly.

On a government-wide basis, the Treasury Board Secretariat is leading the development of *A Framework for the Human Resources Management of the Federal Science and Technology Community*. Drawing together representatives of major science-based departments and agencies, along with employee representatives, the framework will support a new way of doing business for scientific personnel.

Further Detailed Information is Available

This summary document presents only the highlights of the new S&T directions under way in the federal public service. Detailed information can be found in the S&T Action Plans to be released by individual Ministers. Information on the individual plans may be obtained from:

Agriculture and Agri-Food Canada
Steve Chadwick
Research Branch
Tel.: (613) 759-7781
Fax: (613) 759-7768

Environment Canada
Enquiries Centre
Tel.: (819) 997-2800
Fax: (819) 953-2225

Fisheries and Oceans
General Enquiries — Ottawa
Tel.: (613) 993-1516
Fax: (613) 990-1866

Health Portfolio
Strategic Planning and Review Directorate
Policy and Consultation Branch
Tel.: (613) 954-8768
Fax: (613) 954-2496

Human Resources Development Canada
Mike Sims
Information Accountability Division
Human Resources Investment Branch
Tel.: (819) 994-1021
Fax: (819) 994-2085

Industry Portfolio
Jack Smith
Corporate Services
National Research Council
Tel.: (613) 993-7496
Fax: (613) 941-0986

National Defence
Ken Peebles
Chief
Research and Development
Tel.: (613) 996-2020
Fax: (613) 996-0038

Natural Resources Canada
Publications Enquiries
Tel.: (613) 995-0947
Fax: (613) 992-7211

Transport Canada
Shyam Khubchandani
Research and Development
Tel.: (613) 991-6036
Fax: (613) 991-6045
E-mail: khubchs@tc.gc.ca

Treasury Board Secretariat
Jim Ewanovich
Human Resources Development
Tel.: (613) 952-3113
Fax: (613) 957-0425
E-mail: ewanovich.jim@tbs-sct.gc.ca