Brief to the

House of Commons

Standing Committee on Finance

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EXECUTIVE SUMMARY

Agent of Transformation

Canada is developing a global reputation as a place where outstanding research and training is being conducted. Although this new reputation is well deserved, it has not happened by chance. In fact, it is the result of a planned transformation that has taken place across Canada and that has empowered our country's researchers and research institutions to reach for the highest levels of excellence, to participate in the new knowledge-based economy, and to compete with the best from around the world.

The Canada Foundation for Innovation (CFI) has played a significant role in this transformation. The opportunities created by the CFI's programs have helped to reinvigorate the R&D climate, and have changed the atmosphere at Canada's research institutions to one of optimism. Armed with the knowledge that there is support for new initiatives and state-of-the-art infrastructure, institutions have been empowered to establish long-term strategic research priorities and to develop research plans—many for the first time—and set priorities for establishing new facilities, recruiting new talent, training, and fundraising. As a result, institutions are now pursuing new ideas, planning faculty renewal, and attracting and retaining faculty members and researchers. Institutional transformation and renewal are taking place.

Another valuable outcome of the CFI investments is the strengthening of local "knowledge clusters." Infrastructure-based research platforms are key to international competitiveness and to attracting and retaining outstanding researchers. Building on these platforms, institutional strengths, and the researchers recruited, institutions have been able to compete more effectively for research funds from many sources. Research is more cutting-edge and is conducted faster—with more multidisciplinarity and collaboration. The overall result? Canada's research agenda is becoming clear as institutions identify priority areas of research for the future and invest in projects that are producing long-term benefits for countless Canadians. This means a better quality of life due to improved drug treatments and therapies; technology that's faster and better; agriculture techniques that produce safer, more nutritious food; cleaner water, air, and soil; and cleaner forms of energy.

This transformation of the research landscape, however, would not be possible without two vital and essential elements: (i) a pan-Canadian competitive process that selects only the very best infrastructure projects that meet international standards and (ii) partnerships. The CFI and other granting agencies support institutions and their researchers. No single institution or organization, acting alone, can make such a positive impact on Canada's research community. The CFI infrastructure support complements the investment provided to Canadian research institutions through the Canada Research Chairs Program, the graduate student support program, and the provision of the indirect costs of federally supported research. With institutions in a position to attract the best researchers and graduate students, and acquire state-of-the-art tools, these researchers are competing more effectively for support from the federal granting agencies—the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council, and the Social Sciences and Humanities Research Council—as well as from Genome Canada. In cooperation with provincial and municipal governments, as well as the private and volunteer

sectors, the institutions are all working to implement Canada's Innovation Strategy. Along the way, they are helping to create a more innovative society, achieving a reputation for excellence and opportunity, and ensuring a brighter future for generations of Canadians.

Because of its unique status as an independent organization entrusted with large amounts of public money, the CFI attaches paramount importance to operating in an effective and transparent manner, and to communicating its activities and results to a wide audience. The attached document provides information on the CFI, how it operates, what it has done to date, and the results of its investments. More information is available on the CFI website: www.innovation.ca.

The CFI is proud of its record as well as of the achievements of institutions and researchers that are benefiting from new federal investments in research, and particularly in research infrastructure. In the years to come, the CFI will continue to invest in infrastructure projects that provide benefits to Canadians.

The Coming Year

For the coming year, the CFI has adopted the following planning objectives:

- **Reaching for new heights of excellence and innovation**: Through a rigorous merit review process, the CFI will select a limited number of exceptional infrastructure projects. It will invest up to $450M in projects that will enable institutions to address their research priorities and those of their partners, and to be international leaders in areas of strategic importance to Canada.

- **Attracting and retaining the very best**: Through the provision of infrastructure to first-time faculty at universities and to Canada Research Chairs, the CFI will provide the means for institutions to attract and retain the very best researchers. Expenditures are expected to be in the range of $120M and will support up to 800 researchers.

- **Strengthening infrastructure in research hospitals**: The CFI will design and launch a fund for $500M provided by the Government of Canada in the context of the 2003 Accord on Health Care Renewal, to be committed by 2008. The purpose is to help address the need for further investment in research hospital infrastructure, especially for new and different research space.

- **Maximizing the impact of infrastructure investments**: The CFI will continue to ensure the best use of, and gain the most impact from, investments in infrastructure by approving a contribution of up to $156M for the incremental operating and maintenance costs of new projects. This will virtually exhaust the CFI's resources for that purpose. Institutions and their researchers must have access to adequate research funding, in particular for operations and maintenance support over the long term. The CFI will continue to interact with key stakeholders, including granting agencies and provincial programs, to find efficient ways to support all aspects of the research enterprise.

- **Sharing results with Canadians**: The CFI will continue to evaluate the impacts of investments in infrastructure. It will work with institutions to develop strategies to communicate the results and impacts of CFI investments in research infrastructure. The CFI will engage the community in discussion on issues related to benefits to Canada, in part through reports on commercialization and cluster development, sponsorships of conferences and workshops, and public announcements.

- **Fostering excellence in management and operations**: The CFI is committed to transparency, integrity, and fairness. As a service organization, it will continue to improve its policies, processes, and products—including information systems, merit review methods, and the corporate website—in consultation with and in response to its clientele. The CFI will conduct audits and maintain proper financial controls for sound financial management. It will continue to identify new ways to practice excellence in governance and corporate responsibility. As an innovative workplace, the CFI will continue to build strong human-resource practices and policies and provide a stimulating training environment for its employees.

- **Planning the future**: As part of its ongoing strategic planning, the CFI will continue to monitor global research trends and set directions accordingly. In consultation with institutions and other stakeholders, the CFI will anticipate the most effective ways of exercising its mandate for the future, with a particular focus on the period beyond 2005.

Major Challenges

The increased investments of the federal government in research excellence since the creation of the CFI in 1997 have transformed research in all regions of the country. These investments are starting to bear fruit and all indicators point in the right direction. But the momentum must be maintained.

International competitiveness of Canadian research
Research in this country is becoming internationally competitive. In recent years, federal investments have strengthened all the building blocks of a healthy research environment, both for institutions and for their researchers. Provincial governments have recognized the importance of investments in research and research infrastructure. Not only have they contributed to infrastructure projects, but many have also developed new programs and strategies in support of research and research training.

The instruments created are now contributing to all elements of the cost of research:

- Financial support to attract the best graduate students;
- Incentives to attract and retain high-quality researchers;
- Payment of the indirect costs of research to institutions;
- Support for the development, acquisition, operation, and renewal of research infrastructure;
- Support for the direct costs of research.

These elements, or building blocks, are complementary. At a time when institutions are recruiting a whole new generation of very capable researchers, these elements ensure that we can realize the potential created by the availability of state-of-the-art infrastructure. Investments in the direct costs of research through the granting agencies and other foundations, in the indirect costs of research, in human infrastructure through Canada Research Chairs, and graduate student support need to be sustained if we are to ensure maximum returns for the country.

Two areas of particular concern with respect to the CFI have been discussed by the Finance Committee and other committees: ensuring that smaller institutions and institutions in Atlantic Canada compete on a level playing field.

The CFI operates on a "pan-Canadian competitive excellence" basis. It has taken several initiatives to ensure that colleges and smaller universities can be competitive:

- Colleges are eligible for CFI awards.
- Smaller universities have been awarded close to $120M as of June 2003.
- Proposals submitted by colleges and smaller universities across Canada are evaluated by experts who understand the challenges faced by such institutions.
- The formula used for allocating the New Opportunities Fund to institutions is well suited to the particular needs of smaller universities.
- In the Infrastructure Fund dedicated to holders of Canada Research Chairs, the CFI pays 100% of project costs (no matching required) for projects costing $75,000 or less at smaller universities.

With respect to Atlantic Canada, where all but two institutions are colleges and smaller universities, the CFI was concerned with the low investment of provincial governments in CFI-supported infrastructure. Across the country, provincial governments are by far the major partners of institutions in contributing to the funding of infrastructure projects. But until recently, that was not the case in Atlantic Canada. Federal agencies, and the Atlantic Canada Opportunity Fund in particular, have contributed to many projects in Atlantic Canada, partly compensating for lower provincial support. Although the situation was far from ideal, it has recently been improving—New Brunswick, Nova Scotia, and Newfoundland have now created funds to ensure that their institutions are competitive.

Sustainability of the CFI investment

According to recent evaluations of the CFI programs, there is every indication that the ongoing need for infrastructure investments remains high and is increasing. In fact, the enthusiastic response to the fourth competition for the Innovation Fund and the Research Hospital Fund confirms this.

At the same time, research itself is changing—moving faster and faster and requiring more and more sophisticated infrastructure. The research community is expanding and will need new infrastructure to maintain the momentum. Equipment becomes obsolete very quickly and ongoing investment is essential to remain at the forefront.

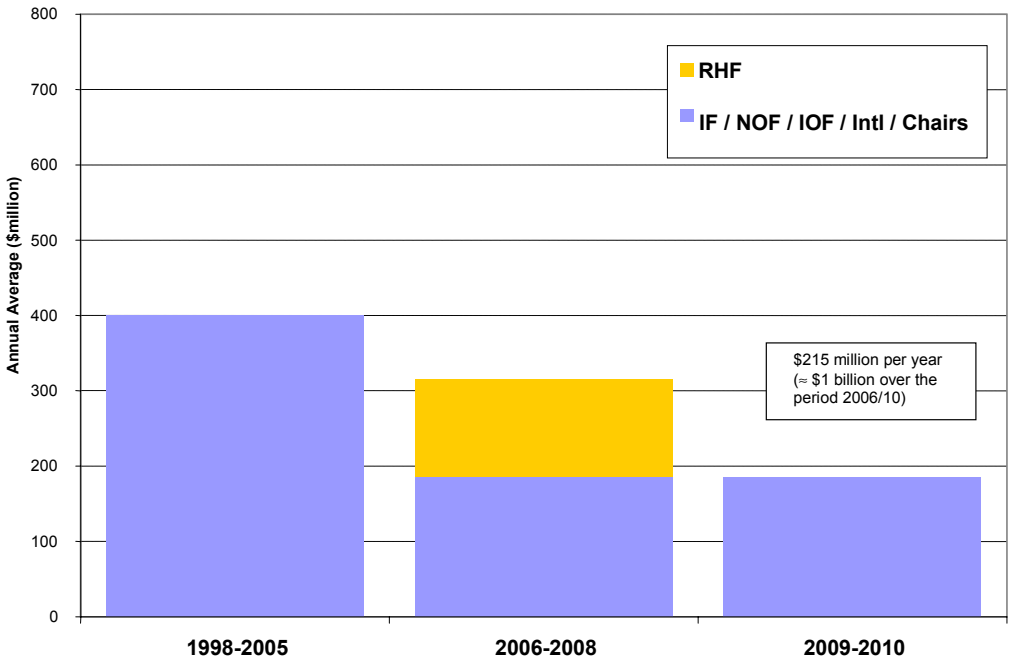
A report on the state of infrastructure in the U.S. published by the National Science Board reached the same conclusions.

Yet, under current projections, the CFI will not have the resources necessary to help institutions maintain the momentum as shown in the following charts. Per year, between 2006 and 2010, the CFI will be left with less than 60% of the investment per year between 1998 and 2005.

Committed and Projected Amounts ($M) 1998-2010

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total Per Fund ($M)
New Opportunities Fund	37.9	23.5	36.7	37.6	54.1	218			156				563.8
University Research Development Fund	19.2	10.3	2.7	2.4	0.5								35.1
Innovation Fund	143.3	224.8	358.6	592.6	–	450							1,769.3
College Research Development Fund		7.3	8.5		–								15.8
Canada Research Chairs Infrastructure Fund			5.3	54.2	35.8	155			No additional funds				250.3
International Funds					163.6	36.4 to be allocated			No additional funds				200
Career Awards					1.9	2	2						5.9
Research Hospital Fund					–	100			400				500
Infrastructure Operating Fund				184.1	16.2	199.7			No additional funds				400
Unallocated Amounts					–			760					760
Total ($M)	200.4	265.9	411.8	870.9	272.1	2,479.1							4,500.2

Average Annual Commitments by the CFI—1998-2010



Moreover, the Infrastructure Operating Fund ends in 2005, leaving institutions with no dedicated resources for ensuring the operation, maintenance, and upgrading of the large infrastructure investment made during the previous seven years.

The Canada Research Chairs Infrastructure Fund also ends in 2005, which means that there is no provision for infrastructure support of the new incumbents that will be recruited as the original Chair Holders complete their mandate.

The Research Hospital Fund ends in 2008.

The CFI estimates that, at a minimum, an additional investment of $1B (or $2.5B when counting partner investments) between 2006 and 2010 would help maintain the momentum and ensure the full and effective utilization of research infrastructure.

Benefits to Canada

The provision of benefits to Canada is one of the three criteria used by the CFI to assess proposed infrastructure projects. Direct benefits arising from research supported by CFI infrastructure are occurring now, but more will continue to accrue over the longer term, given the time required for infrastructure development and acquisition, and given the nature of research itself. All indicators point in the right direction and there is no question that CFI investment is generating benefits to Canada in terms of the training of highly qualified personnel on state-of-the-art equipment, the commercialization of research results, the translation of results in medical practice, as well as is improvements to the environment and to the quality of life in Canada. The CFI is working with institutions, the research community, and other partners to develop more systematic ways of assessing and documenting the research accomplished and the benefits to Canada that result from this research.

INSTITUTIONAL REPORT: Nova Scotia Agricultural College (NSAC)

NSAC's research capacity has continued to increase in 2002. Building on the capacity that the CFI infrastructure has provided, NSAC saw the following successes in 2002:

- Additional operational funding for research (research dollars increased by $0.5 M in the past year, from $3.21M in 2001 to $3.79M in 2002);
- Attraction of two Canada Research Chairs (one approved, one nominated) in areas directly supported by CFI infrastructure (Agricultural Resource Management and Molecular Genetics);
- Retention of four researchers whose programs are directly supported by CFI infrastructure;
- National and international recognition in the areas of organic agriculture and fur animal nutrition/physiology as demonstrated by national and international collaborations and funding support;
- Increase in the number of graduate students in the M.Sc. in agriculture program—numbers of M.Sc. students increased from 55 in 2001 to 62 in 2002;
- New opportunities for doctoral students and postdoctoral fellows in areas supported by CFI infrastructure;
- Development of six multi-million dollar, multi-institutional/industry proposals for submission to the Atlantic Innovation Fund. These six proposals demonstrate a host of new partnerships that revolve around research areas directly supported by CFI infrastructure.

The above successes and developments are on target with NSAC accomplishing its objectives in the priority areas identified in NSAC's Strategic Plan for Research.

1. OVERVIEW OF THE CFI

1.1 The CFI's Mandate

The CFI is an independent corporation established by the Government of Canada in 1997 to strengthen the capacity of Canadian universities, colleges, research hospitals, and other non-profit research organizations to carry out world-class research and technology development. By providing infrastructure support of cutting-edge research, the CFI strengthens research training and promotes an innovative society for the benefit of all Canadians.

The CFI's investments of almost $2B in research infrastructure over the past five years have had a significant impact on the capacity of the Canadian research community to compete internationally. State-of-the art infrastructure is helping to:

- transform the way research is done;
- create a strong and vibrant research environment across Canada;
- attract and retain excellent researchers;
- enhance research productivity and the training of highly qualified people;
- build new national and international networks and partnerships.

The research enabled by this infrastructure is generating benefits for Canadians through the creation of spin-off ventures, the commercialization of discoveries, as well as better health, environment, and public policy.

Through a unique funding partnership, the CFI funds up to 40% of a project's infrastructure costs. The funded institution works with its partners—provincial governments, the private sector, federal departments and the voluntary sector—and commits its own resources to generate the remaining 60% required to complete these projects.

1.2 The CFI's Governance

The CFI is governed by a Board of Directors. The Board meets three to four times a year. The Board makes final decisions on projects to be funded and sets strategic objectives in the context of the funding agreement between the CFI and the federal government. It approves annual plans and objectives, and reviews the outcomes of these objectives each year. It regularly reviews issues from a risk-assessment perspective—determining what risks are acceptable and ensuring that appropriate mitigation steps are in place. This process is being reviewed independently by CFI's auditors. As well, the Board sets the CFI's overall compensation policy, and specifically sets compensation for management.

The Board of Directors also oversees management's responsibilities for financial reporting through its Audit and Finance Committee. The Audit and Finance Committee reviews the financial statements and recommends them to the Board of Directors. The Committee's other key responsibilities include reviewing the budgets, internal control procedures, investments, and advising the Directors on auditing matters and financial reporting issues.

An annual public meeting of the Board is held each year and is widely publicized in several of Canada's leading newspapers.

The Board of Directors reports to 15 Members—a higher governing body similar to a company's shareholders, but representing the Canadian public.

1.3 The CFI's Decision-Making Process

Eligible Canadian universities, colleges, hospitals, and not-for-profit research organizations can apply for CFI support. Before submitting proposals to the CFI, institutions must prepare strategic research plans that outline their priorities for research and infrastructure.

Applications must meet the three CFI criteria:

- Quality of research and need for infrastructure;
- Contribution to strengthening the capacity for innovation;
- Potential benefits of the research to Canada.

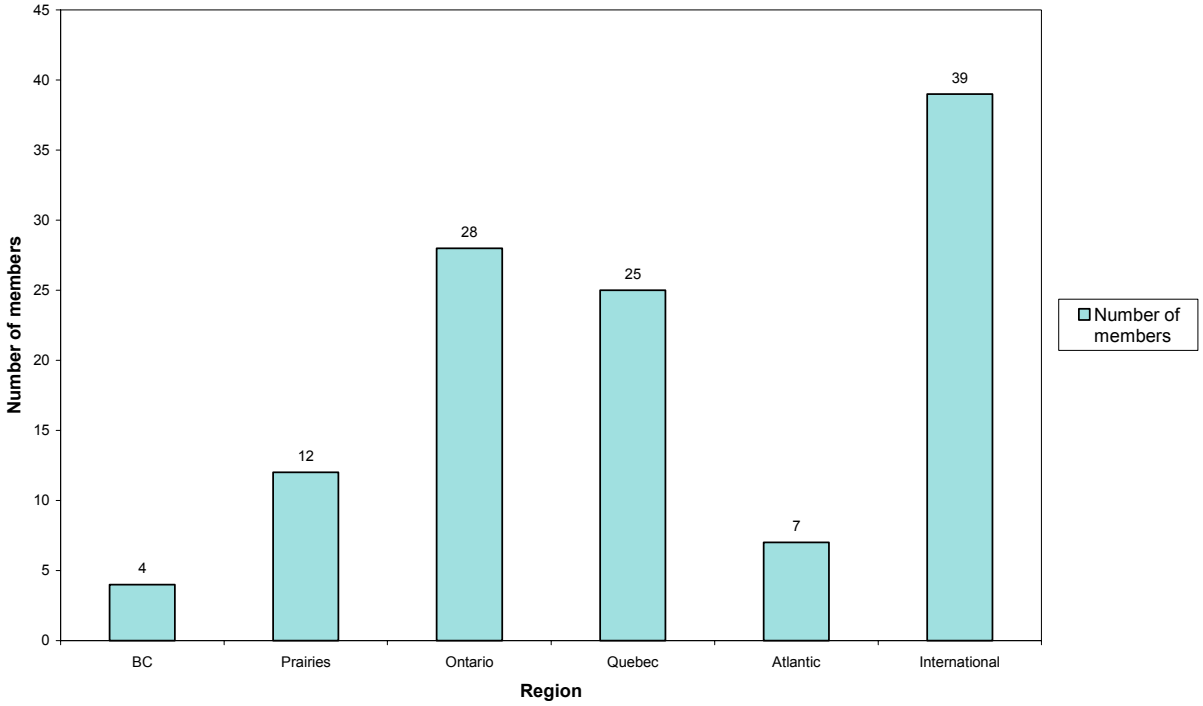
The CFI assessment process is widely accepted and respected by the research community for its fairness and integrity—due in large part to the impartial and independent status of its reviewers. In all, almost 4,000 research infrastructure proposals have been submitted and reviewed by over 3,000 reviewers. At the base of the two-step assessment process lies the evaluation of each project's strengths and weaknesses against the three criteria. This task is accomplished by experts in the relevant fields—either alone or in committee, depending on the size and complexity of the project. The results of this review are forwarded to multidisciplinary assessment committees (MACs) whose mandate is to recommend to the Board of Directors which projects represent the most effective investments of public funds in research infrastructure.

Committee members come from every region of Canada and from around the world. They are selected for their broad experience and expertise in research, research management, and the use of research results. When selecting these volunteer members, the CFI strives to achieve a reasonable balance between language, gender, region, sector of the economy, discipline, and type of institution. MAC membership is posted on the CFI website. As of June 2003, more than 265 individuals have served on MACs—with about 30 percent of them coming from other countries (in the previous competition, there were 39 members from abroad, more than from any single region of Canada). Members of the multidisciplinary evaluation committees and expert reviewers for the fourth competition for the Innovation Fund are currently being appointed. As was the case the last time, members from outside Canada will be the largest group. The reason for this is to avoid conflict of interest and to ensure that proposals are evaluated according to international standards.

It should be noted that proposals submitted by colleges and smaller universities are evaluated by separate committees composed of persons who are familiar with the research environment in such institutions.

Figure 1 shows the regional distribution of committee members.

FIGURE 1 - Regional Distribution of Committee Members (2001 IF Competition)



Expert reviewers and MAC members are expected to maintain the highest standard of integrity in fulfilling their role and sign a statement to that effect. The expertise and knowledge of these volunteers have played a significant role in ensuring that the CFI funds projects that will benefit countless Canadians and will contribute to strengthening Canada's research capacity and reputation.

1.4 The CFI's Investments

A Commitment from Many Partners

The initial federal investment of $800M in the CFI has grown to $3.65B as of July 2003. This, in turn, is projected to grow to approximately $4.5B with accumulated interest. When including partner contributions it is expected to generate investments in excess of $10B by 2010.

From 1997 to 2003, the CFI's Board of Directors has approved and financed 2,852 projects, representing an investment of close to $2B in research infrastructure at 113 universities, hospitals, colleges, and not-for-profit research organizations across the country. These organizations are located in Canada's 10 provinces in 56 municipalities.

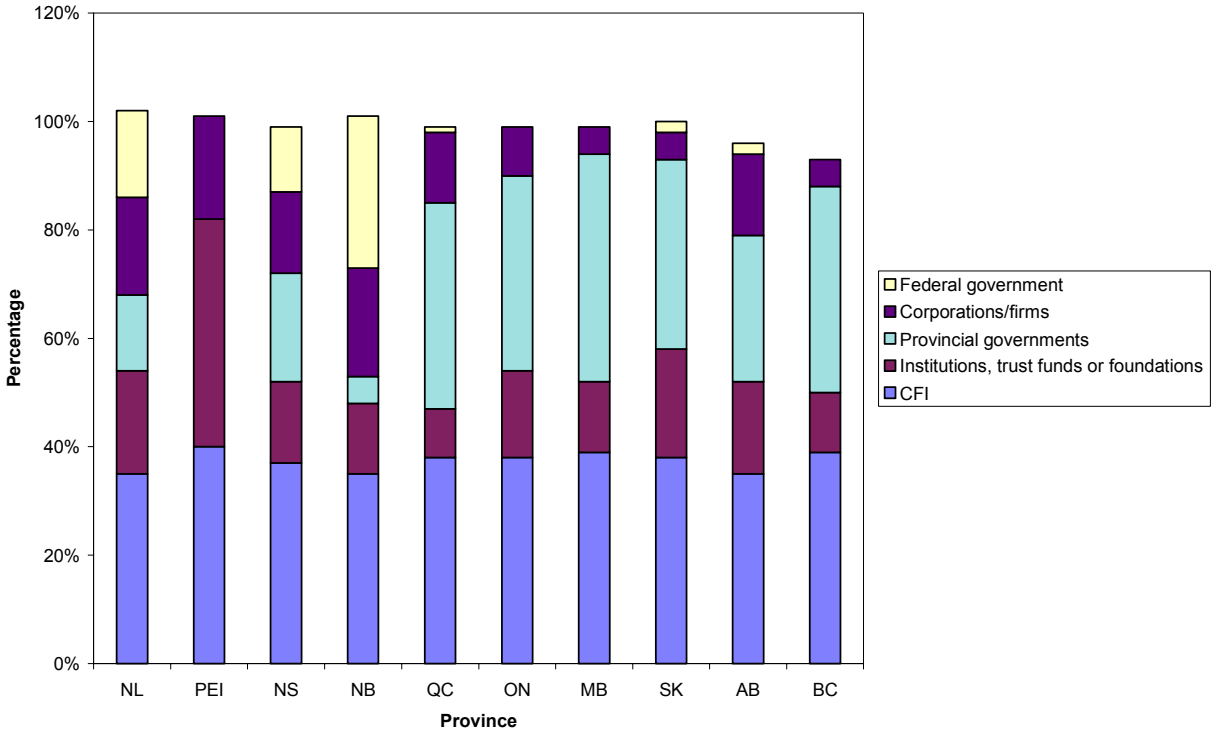
Combined with funding from the institutions themselves, as well as other partners, to date the CFI has triggered an investment of over $5B in research infrastructure and CFI-infrastructure operating funds.

Provincial governments are by far the major partners of institutions, but other public organizations such as the Atlantic Canada Opportunity Agency have made significant contributions to CFI projects.

Of the close to $2B committed by the CFI to date, $1.2B has been finalized (i.e. the required funding from partners is confirmed, payments are proceeding, and the projects are underway). This $1.2B has triggered close to $2B from partners. As shown in Figure 2, on average, the CFI funding represents 38% of total eligible costs while provincial governments contribute 36%. There are variations from province to province as provincial contributions vary from 0% to 40%. Provincial governments in Atlantic Canada have contributed less than those of the other provinces. However, the situation has been improving in the last year: New Brunswick, Nova Scotia, and Newfoundland have now created funds to ensure that their institutions are competitive.

Figure 2 also shows the significant investment leveraged not only from provincial governments, but also from the institutions themselves (14%), and from the private sector (11%). Most private sector contributions take the form of deep discounts on equipment and there is no significant regional variation.

FIGURE 2 - Funding Sources



In addition to the contributions of partners to infrastructure costs, which often exceed 60%, the CFI funding has stimulated large investments in research funding by provincial governments, the private sector, international organizations, and numerous other sources.

The CFI Programs
The CFI's investments are made through the following infrastructure support programs:

- The **Innovation Fund** enables eligible institutions to strengthen their research infrastructure in priority areas as identified in their strategic research plan. The fund promotes multidisciplinary and inter-institutional approaches, and enables Canadian researchers to tackle groundbreaking projects. To date, the CFI has held three competitions for the Innovation Fund, in which it has approved $1.3B in 586 projects at 83 institutions. The fourth competition is underway and results will be announced in March 2004.

- The **Research Hospital Fund** is designed to contribute to research-hospital-based projects that support innovative research and training. The $500M fund was allocated to the CFI by the federal government as part of the 2003 Accord on Health Care Renewal, making it possible to take full advantage of state-of-the-art equipment, innovative ways of doing research, and the hospitals' increased research capacity. The first competition for this fund is underway.

- The **New Opportunities Fund** provides infrastructure support to newly recruited academic staff. The fund helps universities attract world-class faculty members in areas that are essential to the institutions' research objectives. To date, the CFI has awarded $223M at 68 institutions to more than 1,889 newly recruited faculty.

- The **Infrastructure Operating Fund** contributes to the incremental operating and maintenance costs associated with the infrastructure projects funded by the CFI. Since the inception of this $400M fund in 2001, the CFI has invested $210M in 89 institutions. This fund terminates in 2005.

- The $250M **Canada Research Chairs Infrastructure Fund** provides infrastructure support to the Canada Research Chairs Program, which is establishing 2,000 world-class research positions at Canadian universities by 2005. To date, the CFI has approved $104M for the research infrastructure of 716 Chair Holders. This fund terminates in 2005.

- The **Career Awards Program**, in partnership with federal granting agencies, recognizes and supports outstanding researchers by providing institutions with the infrastructure that is essential to carry out their research program. The CFI intends to invest up to $2M a year in this Fund, created in 2002. To date, it has invested $1.9M in the infrastructure of five NSERC Steacie Fellows and two CIHR Distinguished Researchers.

- The **International Joint Ventures Fund** 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 **International Access Fund** helps Canadian institutions and researchers access major international collaborative programs and facilities in other countries. The Canadian portion of projects that qualify for these funds are financed up to 100%. Following the 2002 competition for these funds, nine projects are proceeding, for a maximum CFI investment of $165.6M.

The Distribution of CFI Funding

The following figures and tables show the number and amounts of CFI investment as of June 25, 2003, per province (Figure 3), per type of institution (Table 1), and per program (Table 2). The number of projects and amounts awarded to each institution are found in Appendix 1.

FIGURE 3 - Total CFI Dollars by Provincial Population (to June 25, 2003)

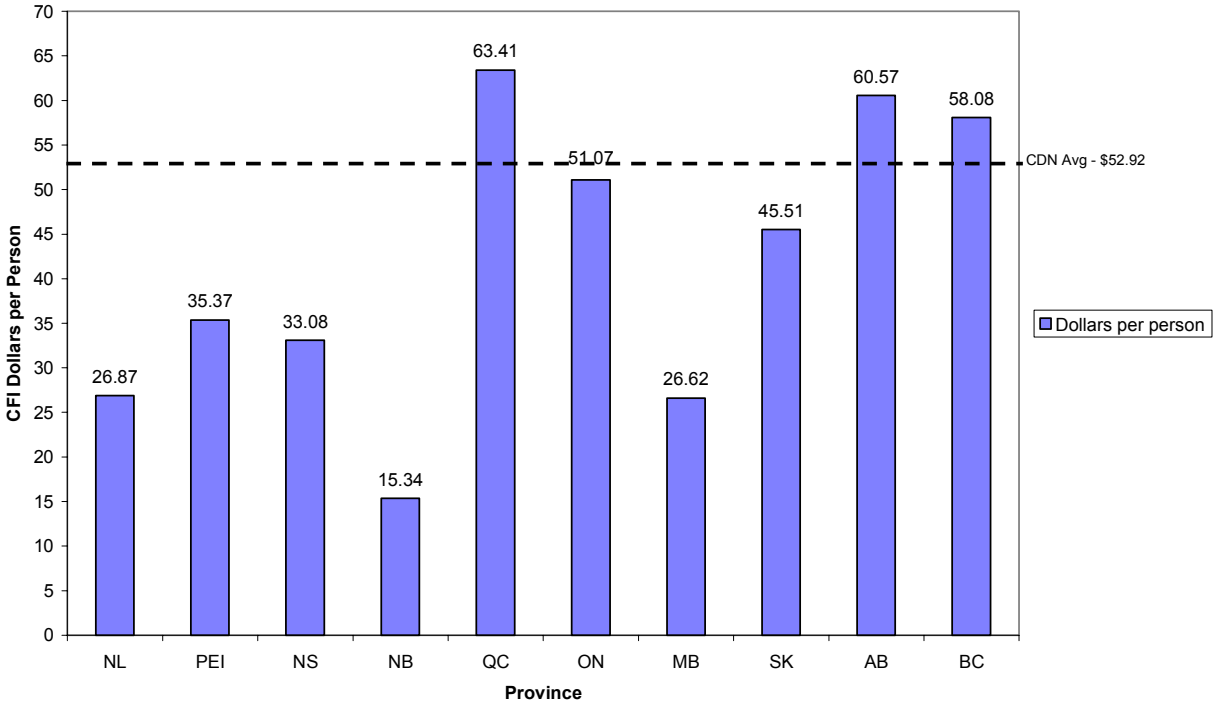


TABLE 1 – Total CFI Contributions per Type of Institution

Type of Institution	Maximum CFI Contribution	Number of Projects
Large Universities	$1,447,256,178	2,336
Small Universities	$118,654,531	441
Colleges	$20,983,942	48
Research Hospitals	$127,141,676	29
Not-for-Profit Institutions	$10,714,279	4

TABLE 2 - Total CFI Contributions as of June 25, 2003

Program	CFI Amount	Number of Projects
Canada Research Chairs Infrastructure Fund	$104,609,351	718
Career Awards	$1,941,193	7
College Research Development Fund	$15,876,609	40
Innovation Fund	$1,316,327,133	586
International Access Fund	Amounts not Finalized	6
International Joint Ventures Fund	$27,574,683	3
New Opportunities Fund	$223,318,912	1,380
University Research Development Fund	$35,102,725	118
Project Total	$1,724,750,606	2,858
Infrastructure Operating Fund (Current Maximum Allocation)	$210,359,969	-
Grand Total	**$1,935,110,575**	**2,858**

The CFI operates on a pan-Canadian competitive excellence basis. It has taken several initiatives to ensure that colleges and smaller universities can be competitive:

- Colleges are eligible for CFI awards.
- Smaller universities have been awarded close to $120M as of June 2003.
- Proposals submitted by colleges and small universities across Canada are evaluated by experts who understand the challenges faced by such institutions.
- The formula used for allocating the New Opportunities Fund to institution is well suited to the particular needs of smaller universities.
- In the Infrastructure Fund dedicated to holders of Canada Research Chairs, the CFI pays 100% of project costs (no matching required) for projects costing $75,000 or less at smaller universities.

The CFI investments cover virtually all areas of research. Many countries have conducted top down exercises to establish national (or regional) research priorities. In fact, nearly all countries worldwide that have conducted such exercises have selected the same priorities. The CFI, for its part, does not target disciplines, areas or themes, but asks institutions to identify their own priority areas and submit infrastructure proposals in these areas. In an after-the-fact analysis, the CFI has regrouped the awards it made to date in thematic areas that fall under eight categories, corresponding to the priorities by the European Union's Sixth Framework. The number of projects and amounts invested in these thematic areas are listed in Appendix 2.

At the end of March 2003, the CFI had disbursed $881M to institutions and it is estimated that approximately $1.4B will have been paid by March 31, 2004. Funds held by the CFI are invested in low-risk securities, in accordance with strict guidelines outlined in the CFI Funding

Agreement with the government. Since 1997, the return on the investment has averaged 5.69% per annum.

1.5 The CFI's Accountability Mechanisms

The CFI is committed to the principle of public accountability. As a result, it places great importance on evaluating the impact of its investments in research infrastructure. It also recognizes its responsibility to deliver programs that focus on Canada's needs and enable researchers to compete in the global, knowledge-based economy.

The CFI has many forms of accountability and operates in a highly transparent manner. The CFI has undertaken formal evaluations of its programs to assess their impact and to help determine the benefits they are producing for Canadians. These evaluations have been widely disseminated and are available to the public on the CFI website, along with program and financial information.

To ensure that the institutions that receive infrastructure support are generating the best possible results for the benefit of Canadians, the CFI requires that they be accountable in a number of ways. Institutions are requested to develop and periodically update strategic research plans and priorities to reflect the changing environment which are made public. Institutions are also required to submit annual reports describing progress against these plans. These are published on the CFI website. Institutions must also report on the results of each project for a period of at least five years. And as part of an overall commitment to highlight CFI investment in their region, institutions are asked to submit communication plans.

All approved projects over $4M are subject to independent audits at the institution, as is a sampling of all other projects. Audits conducted to date concluded that institutions generally use CFI funding in a responsible manner. In partnership with the federal granting agencies, the CFI also conducts regular monitoring visits to confirm the soundness of fiscal accounting practices at the institutions.

The independent merit review process was described in sections 1.2 and 1.3.

The Minister of Industry tables the CFI's Annual Report in Parliament and it is widely distributed by the CFI each year. The CFI also makes regular appearances and submissions to standing committees of the House of Commons and Senate and has a process in place to provide briefings to Members of Parliament, Senators and senior government officials.

The CFI's Funding Agreement with the Government of Canada has recently been amended to strengthen accountability provisions, in particular with respect to annual reporting requirements and to enable the government to have audits carried out or to ask the Board to have audits carried out to ensure compliance with the terms of the funding agreement. Another amendment specifies that the CFI will give notice to the Minister regarding significant public announcements or ceremonies relating to activities being funded, and that all public materials will recognize and acknowledge the contributions of the government. Another important change to note is that, if the CFI is wound up or dissolved, any remaining amounts not otherwise committed may be repaid to the government or, at the discretion of the Minister, distributed among all the eligible

recipients that have received grants from the CFI in proportion to the grants received. Finally, any person who has been lobbying on behalf of the CFI will be registered pursuant to the Lobbyist Registration Act at the time the lobbying occurred.

INSTITUTIONAL REPORT: The University of Western Ontario

SHARCNET is a multi-institutional high performance computing project:

- SHARCNET has a deep relationship with its primary private sector partner Hewlett Packard (HP) Canada. By virtue of the demanding needs and varied research interests of its users, SHARCNET is a favoured beta-test site for several HP products. Of particular note are the SEPIA scalable visualization solution and the XC supercomputer (which will be HP's next generation massively parallel computer cluster).
- SHARCNET has partnered with Nortel to install optical networking equipment between the computer clusters at UWO. This was one of the first, if not the first, instances in which optical communications equipment had been used within a campus for strictly computational purposes. The success of this project was one factor in Nortel's decision to develop a new line of optical communication equipment to support academic and industrial campus computing environments.
- SHARCNET has worked with Platform Computing to beta test their Load Sharing Facility software and is involved with the Platform R&D team to develop new capability in their product lines.

2. HIGHLIGHTS OF THE LAST YEAR

2.1 Launching of the Fourth Competition for the Innovation Fund

The CFI launched a Call for Proposals for the Fourth Innovation Fund Competition in October 2002 with a budget of up to $450M. The first step was the submission of Notices of Intent (NOIs) in December 2002. The CFI received more than 900 Notices of Intent requesting some $2.5B from the CFI.

As a result of the overwhelming response to its Call for Proposals, the CFI asked institutions to proceed with only those projects that are the most closely aligned with the objectives of the program as well as with their strategic research plan and institutional priorities. Institutions responded to this plea and, in May 2003, submitted 555 applications. However, total requests of $1.63B still far exceed the $450M budget. A large number of proposals involve holders of Canada Research Chairs. Others are requesting infrastructure support for new emerging CIHR teams who need new facilities for their research. Still others emanate from researchers involved in networks funded by NSERC or the Canadian Foundation for Climate and Atmospheric Sciences. This shows the complementarity of federal support programs, with the CFI providing the infrastructure and the other programs building the teams and funding the research programs.

The evaluation of these proposals is underway and the Board of Directors will take decisions in March 2004.

2.2 The Research Hospital Fund

Again this year, the federal government entrusted the CFI with new money, this time to help build capacity in Canada's research hospitals. The CFI is grateful to the federal government for this mark of confidence and intends to invest these funds in excellent projects that will have significant impacts on the health of Canadians.

As part of the 2003 Accord on Health Care Renewal with the provinces, the federal government has allocated $500M to the CFI to create a Research Hospital Fund (RHF). The purpose of this allocation is to help address the need for further investment in research hospital infrastructure, especially for new and different research space. This 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. The new infrastructure will facilitate research that can lead to groundbreaking discoveries and knowledge that can be translated into improved health for Canadians, more effective health services and products, and a better health care system.

The Research Hospital Fund is designed to contribute to research hospital-based projects that support innovative research and training. Of particular interest are those large-scale infrastructure projects that take an integrated and multidisciplinary approach to health research—biomedical, clinical, health services and population health research.

Given the urgent infrastructure needs, the CFI has moved quickly with the launching of this fund by integrating the first phase of its first competition with the current competition for the Innovation Fund. Up to $100M will be invested in hospital-based research infrastructure projects that complement projects approved in the current Innovation Fund competition. The pre-screening of project outlines will be completed in March 2004. Full proposals will be submitted in May 2004 and the Board of Directors will make decisions in the fall of 2004.

2.3 Launching of International Projects

After reviewing 72 submissions proposing projects worth a total of $1 billion, and selecting 19 for further evaluation, the CFI is proceeding with the funding of nine international projects: three International Joint Ventures projects and six International Access Fund projects. Approved projects cover a vast array of research areas, including marine and environmental sciences, infectious diseases, astronomy, light sources, and particle physics.

Three projects are proceeding under the International Joint Ventures Fund:

- A **research icebreaker** to study the changing Arctic Ocean and global climate change issues;
- A highly innovative **5-beam advanced laser** capable of spanning a very wide range of wavelengths. This fundamental tool will transform the Canadian research and training environment in disciplines such as physics, chemistry, and biotechnology;
- A major new **International Facility for Underground Science** to transform Ontario's internationally renowned Sudbury Neutrino Observatory (SNO) from a large-scale experiment to a world-class facility and scientific destination.

Six projects were selected under the International Access Fund:

- The **Neptune Program** to strengthen Canada's leadership in research in the deep ocean;
- The **Canada-Kenya research laboratory** to provide outstanding researchers in Canada—and their international collaborating partners in Nairobi, Oxford and Washington—with a state-of-the-art facility for research on highly infectious diseases such as AIDS and hemorrhagic fever;
- **SCUBA-2,** a joint Canada-UK camera, to be located on the James Clerk Maxwell Telescope in Hawaii, to produce images of the deep universe using radio waves;
- The Canadian access fee to the **Atacama Large Millimetre Array (ALMA) Telescope**—a major international construction to be based in Chile, which will be the foremost land-based astronomical instrument over the next 20 years;
- A beamline at the most advanced **neutron spallation installation** in the world, at Oak Ridge, Tennessee in the U.S., to secure the leadership of Canadian researchers in using neutrons to look at engineering materials;
- The **KOPIO Project**—a new experiment in particle physics to explore the origin of matter. The project is a major new international initiative led by a team of internationally renowned Canadian scientists in Canada, and involves 63 scientists in six countries.

2.4 Forging Partnerships

The CFI is about stimulating partnerships and collaboration. In addition to the numerous partnerships between institutions and those organizations that contribute to infrastructure (provinces, federal departments and agencies, industry, and voluntary agencies), the CFI investment triggers partnerships and collaboration among institutions in the development of regional, national, and international infrastructure projects. In particular, the institutions have been extremely effective in putting together applications to various agencies in support of their plans and priorities.

Provincial governments have recognized the importance of investments in research and research infrastructure. Not only have they contributed to infrastructure projects, but many have also developed new programs and strategies in support of research and research training.

For its part, the CFI itself works with other agencies through joint programming and joint project reviews.

The CFI has triggered a large number of multi-institutional projects, networks, and centres and has helped strengthen collaboration between universities and research hospitals. The current competition for the Innovation Fund includes a large number of requests for multi-institutional infrastructure projects.

The CFI is increasing collaboration with the three federal agencies. In addition to the ongoing collaboration with granting agencies in the management of the Canada Research Chairs Program and the creation of the Career Awards Program, the CFI and granting agencies jointly support innovative projects.

The *Amundsen*, a recently refurbished icebreaker funded under the CFI International Joint Ventures Fund, is an example of multi-institutional and multi-agency collaboration:

> A $27.6M proposal submitted by a consortium of Canadian universities and federal agencies to transform the icebreaker Sir John Franklin into a state-of-the-art research vessel was accepted by the International Joint Ventures Fund in June 2002. Given its scope and multidisciplinary nature, the science plan supported by this infrastructure taps a large fraction of Canadian and foreign expertise in arctic oceanography. In Canada, the research icebreaker will sustain the concerted arctic work of 33 principal investigators from 15 Canadian universities and 35 principal investigators from 7 federal institutes in 5 federal departments. Through previous, ongoing, and planned collaborative efforts (that would not have been possible without the support of NSERC), the Canadian universities and federal institutions involved in the research icebreaker project already form a unique and effective national network in Arctic oceanography. Over 75 arctic experts from 48 institutions in 11 foreign countries will also contribute directly to the science plan supported by the infrastructure. Thanks to the great efforts of the Canadian Coast Guard, the modernization and refit of the icebreaker proceeded smoothly and the ship embarked on her first scientific research mission in September 2003.
>
> Building on this unique infrastructure and on the excellence of research supported by the federal granting agencies, researchers have put forward a successful proposal to the Networks of Centres of Excellence Program. ArcticNet, a new network, funded at $25.7M over four years, and enabled by the CFI investment, was announced in August 2003.

2.5 Annual Reports Show Major Impacts of the CFI on Research

This year again, the CFI asked institutions to submit annual reports summarizing the impact of the CFI investments on the institution as a whole, as well as a progress report on each CFI-funded project. These reports are currently being analyzed in detail by an independent consultant. The analysis will be posted on the CFI website, along with a copy of institutional reports. Preliminary results of this analysis are highlighted below.

INSTITUTIONAL REPORT: Université de Sherbrooke

The CFI infrastructure and CFI's current funding programs provide valuable support for the implementation of research development strategies. This infrastructure has direct and indirect impacts on each of the four major thrusts of the Strategic Action Plan, and on the targets and actions chosen to implement them.

Institutions continue to report that the CFI has helped transform the research landscape in this country:

- Institutions report a major impact of CFI infrastructure on attracting researchers, postdoctoral fellows and graduate students. The 552 Innovation Fund projects analyzed to date have helped to attract 1,718 new researchers and retain 1,425 others. CFI infrastructure is credited for the attraction of more than 3,000 postdoctoral fellow (55% from abroad) and almost 9,000 postgraduate students (approximately 30% from abroad). The infrastructure is also credited for advancing the training of almost 6,200 undergraduate students (or equivalent).

- They credit the CFI for their increased ability to obtain research funding. Many note that the CFI investment has leveraged not only the required matching funding, but additional capital investment and major research funding from Canadian and international sources. Almost 75% of respondents reported that the infrastructure had some impact on their ability to attract funding from the federal granting agencies. More than 50% reported a positive impact on their ability to attract provincial funds and more than 30%, funds from international sources.

- The CFI infrastructure continues to have a major impact on collaboration and networking. For example, 74% of respondents believe that their CFI project had some impact on fostering international collaborations and 55% believe that the impact was significant or major.

- The analysis of benefits to Canada is incomplete, but early results point to a significant increase in the number of outcomes that can be attributed to CFI infrastructure (patents, licences, spin-off companies, health improvements, etc.).

Extracts throughout this report provide examples of successful CFI projects. They involve major collaborations, have leveraged significant funding from various sources, and are generating benefits to Canadians.

INSTITUTIONAL REPORT: University of Ottawa

The Canadian Century Research Infrastructure (CCRI) project is a partnership of several universities: the University of Ottawa, Memorial University of Newfoundland, Université Laval, Université du Québec à Trois-Rivières, York University, the University of Toronto, and the University of Victoria. One of the largest social science projects ever funded by CFI, the CCRI will create a series of databases from census records covering a century of Canadian life. The databases will allow researchers to examine social structures and how they have changed in detail, which until now was simply not available. The CCRI will spark bold and creative new approaches to the study of Canada in universities across the country and around the world.

2.6 Third-Party Evaluations of CFI Programs

Third-party evaluations have been completed for all of the CFI funds except the newly created International Funds and the Infrastructure Operating Fund. Overall, the programs have had a marked impact and are meeting the objectives set out by the government. The evaluation of the New Opportunities Fund was completed in early 2002 and the following evaluations were conducted in the last year:

- Innovation Fund, University Research Development Fund, and College Research Development Fund;
- The three-year review of the Canada Research Chairs Program.

The full reports of these evaluations are available on the CFI website (www.innovation.ca). Highlights follow:

New Opportunities Fund

- The objectives of the New Opportunities Fund are reasonable and realistic. And the fund is meeting these objectives.
- The New Opportunities Fund has been a critical factor in attracting high-calibre researchers to universities. From the 2001 awards, 64% of new investigators named the fund as one of the reasons they were attracted to the institution and/or Canada.
- More than 40 percent of the researchers awarded New Opportunities funding were hired from outside Canada.
- The fund helped to bring 55 researchers back from the United States, where they had gone after earning their Ph.D. in Canada.
- The fund has played an even more critical role in retaining outstanding researchers, reversing the "brain drain." From the 2001 awards, 89% said the fund was a factor in their decision to stay in Canada or at the Canadian institution.
- The state-of-the-art equipment and facilities the fund has financed have advanced the careers of new investigators. A large majority—89%—of investigators reported the investment has increased the quality and productivity of their research.
- For two-thirds of researchers, the new infrastructure is a major factor in attracting more high-quality graduate students and providing them with better training. An overriding majority of researchers (94%) believe that it has improved the career prospects of their graduate students.

- 90% of researchers consider the quality of their infrastructure to be above average compared to similar infrastructure in Canada and elsewhere in the world.

Innovation Fund, University Research Development Fund and College Research Development Fund

In 2002, the CFI asked BearingPoint (formerly KPMG Consulting) to evaluate the Innovation Fund, the University Research Development Fund, and the College Research Development Fund. The CFI wanted to know whether these funds were well-designed and managed, whether they had an impact on Canada's research capacity, and whether the research made possible by these funds was generating benefits to Canada.

The University Research Development Fund was a fund designed to strengthen the research infrastructure of smaller universities whereas the College Research Development Fund was designed to help Canadian colleges, institutes, and their affiliated research centres develop and strengthen their research infrastructure in areas identified in their strategic research plans. Since 2001, institutions that were eligible for these two funds have been submitting proposals to the Innovation Fund.

The evaluation looked at contributions approved by the CFI between 1998 and early 2002. The main sources of information were a review of CFI progress reports, documents, and files; interviews with representatives of committees that reviewed applications; interviews with representatives of the granting councils, the provinces, and industry; case studies of specific projects; and benchmarking to other programs worldwide. The results of the evaluation are very positive and show that these programs are meeting their objectives of building Canada's capacity for innovation, and thus improving Canada's economic and social well-being. Key findings of the report include:

- The programs have transformed the quality of infrastructure. Where more than half of the infrastructure in the case studies was poor or fair prior to the awards (and none was world-class), 90% of case study respondents now rate it as excellent or world-class in the disciplines affected by the awards.
- The projects enabled by the CFI have contributed significantly to the creation of national and (especially) regional "knowledge clusters."
- The projects have had an exceptionally strong positive impact on the nature of research that is carried out: more cutting-edge research, conducted faster, with more multidisciplinarity, and with substantially more collaboration.
- Smaller institutions in particular reported increased visibility and credibility both nationally and internationally as a result.
- The majority of projects enabled by the CFI have increased the ability to attract researchers, postdoctoral fellows, and students.
- Although it is too early to attempt a meaningful quantitative investigation of the social and economic impacts of the CFI for Canada, every indication is that these projects will eventually be very significant in these areas.
- A review of infrastructure support programs in other countries showed not only that the CFI contains all elements considered important in other countries and programs, but also that it is very well-regarded by the international community and even envied in some quarters.

- There is every reason to think the projects, once operational, are being effectively and efficiently used and shared.
- The programs were well-designed and are well-delivered, with very few problems being reported in any area.
- Participation from researchers in the social sciences and humanities is still low.
- There is every indication that ongoing need for infrastructure investment remains high, and may even increase as social sciences and humanities researchers begin to participate more.
- Both implementing the projects and finding financial resources for operations and maintenance have been problematical in many institutions.
- Maintaining long-term sustainability of the programs will require institutions to convince their provincial partners (and others) to continue to supply matching funds given that CFI contributes a maximum of 40% of total project costs.

Canada Research Chairs Program
The three-year review focused on the Chairs Program (not the infrastructure component per se). It concluded that the program played a role in retaining excellent researchers in Canada:

> "Although the Program is just two years old, it is seen by those consulted as a very successful initiative. It is providing universities with an incentive to develop further research capacity following a planned and coordinated approach. It is helping to create and develop centres of research excellence that are leading to a strengthened and more internationally-competitive research environment in Canadian universities and related research institutions."

The review also commented on the CFI component, particularly its impact on retaining and attracting researchers:

> "The CFI component is important. Over 90% of respondents considered 'infrastructure availability' to be a factor in accepting a Chair award. Many (57%) considered it a major factor."

2.7 Priority on Communicating Results

- There has been wide reporting in the media on many CFI-supported projects and announcements. An independent analysis of the CFI media coverage by Cormex indicated that: "once again, the CFI witnessed the highest profile compared to federal agencies involved in promoting research and innovation."

- In late 2002, the CFI launched ***inno'va-tion*** and ***inno'v@-tion2: Essays by Leading Canadian Researchers***. This project consists of a book published by Key Porter Books featuring 25 essays and eight interactive essays published on the CFI website. The book is available through the CFI and in bookstores across Canada. There is a link to the interactive essays on the CFI website.

- The CFI publishes ***InnovationCanada*** (www.InnovationCanada.ca), an e-magazine featuring success stories of CFI-funded research in universities and research institutions across Canada. This online magazine boasts up to 170,000 hits bi-monthly. The seventh issue was recently launched.

- The CFI has undertaken a Municipal Outreach Initiative aimed at informing municipalities of the impacts of the CFI investments in their communities.

- The CFI will organize or be involved in over 75 events this year. These events provide opportunities for Members of Parliament and government representatives to join the CFI in showcasing the research enabled through CFI investments.

- Institutional reports for the year ending on March 31, 2003 will be posted on the CFI website along with an analysis of annual project reports. These reports provide numerous examples of successful CFI projects.

INSTITUTIONAL REPORT: Cégep de Saint-Hyacinthe

Groupe CTT, the research arm of Cégep de Saint-Hyacinthe in the field of textile and paratextile materials, strengthened its innovation capacity in the area of personal protection and environment protection using textile and geosynthetic materials. The Group pursued major R&D projects in partnership with industry. Thus far, five industrial partners have participated or are currently participating with Groupe CTT in technology development projects or in the development of new products based on this technology.

2.8 The CFI as a Catalyst of Commercialization and Other Benefits to Canada

Last year for the first time, the CFI completed a detailed analysis of commercialization activities at Canadian universities. This information has recently been updated and the report will be posted shortly on the CFI's web site. The overall picture is very encouraging. The report is divided into two major sections:

- Data collected by the Association of University Technology Managers from U.S. and Canadian universities;
- Brief reports prepared at CFI's request, by 84 of the 101 institutions having received CFI funding. These reports highlight institutional strategies for ensuring that research facilitated by the CFI infrastructure will result in benefits to Canada. In requesting the reports, the CFI asked specifically for strategies related to commercialization while recognizing that research will result in other types of benefits, such as improvements to health, the environment, and quality of life as well as other types of economic benefits.

In the first part of the report, commercialization activities in Canadian and American universities are compared, over time (in 1999 and 2001), using the following indicators:

- Total sponsored research expenditures;
- Invention disclosures received;
- Licences and options executed;
- Licence income received;
- U.S. patents issued;
- Start-up companies formed.

When the data are normalized by dollar of research support, Canadian universities compare well with their U.S. counterparts:

Table 3 shows commercialization activity in institutions from the two countries and the changes from 1999 to 2001. In Canada there is a 50% rise in research support, a 50% increase in licences and options executed, a 200% rise in licence income, and a 40% increase in spin-off companies formed. In the U.S. there is a continuing rise in research support, a steady rise in the other totals, and a sharp rise of about 70% in licensing income.

TABLE 3 - Total of Various Commercialization Indicators - 1999-2001

		Research $	**Disc.**	**Licence & Options**	**Licence Income $**	**U.S. Patents**	**New Start-up Companies**
Canada	2001 (19 inst.)	1,608 M (U.S.)	860	306	40.6M (U.S.)	152	65
	2000 (15 inst.)	1,266 M (U.S.)	876	280	23.9M (U.S.)	135	58
	1999 (15 inst)	1,052M (U.S.)	671	201	12.7M (U.S.)	153	47
		adjusted for indirect costs					
United States	2001 (19)	7,812M (U.S.)	4 985	1 485	392.9M (U.S.)	1 576	146
	2000 (15)	6,292M (U.S.)	1 464	4 015	231.6M (U.S.)	1 294	136
	1999 (15)	5,668M (U.S.)	3 773	1 378	231.6M (U.S.)	1 234	93

Table 4 converts these figures to commercialization activity per $1M (U.S.) of research support. This table is particularly instructive in documenting commercialization productivity.

TABLE 4 - Commercialization Productivity Indicators - 1999-2001
(per research $1M U.S.)

		Invention Disclosures	Licence & Options	Licence Income	U.S. Patents	New Start-up Companies
Canada	2001 (19 inst.)	0.539	0.190	25,270	0.095	0.040
	2000 (15 inst.)	0.692	0.221	18,864	0.107	0.046
	1999 (15 inst)	0.638	0.191	12,087	0.145	0.045
United States	2001 (19)	0.638	0.190	50,300	0.202	0.019
	2000 (15)	0.638	0.233	36,810	0.206	0.022
	1999 (15)	0.663	0.242	40,715	0.217	0.016

- Invention disclosures per research dollar are almost constant over time and between countries. This linear relationship is quite stable.
- Licences and options per research dollar executed are constant over time and essentially the same between the two countries.
- Licensing income per research dollar has doubled in Canada and has increased by 25% in the U.S. Because of time lags and the rapidity of increasing research, this can be expected to rise further.
- U.S. patents issued per research dollar are roughly constant over time, but are twice as high in the U.S. as in Canada.
- Start-up companies per research dollar remain roughly constant over time, but the Canadian rate is more than double the U.S. rate.

The commercialization productivity patterns are remarkably constant over time, but show that Canadian institutions are already making good progress on their commitment to double research activity and triple commercialization activity by 2010.

High start-up company activity and lower (but rapidly rising) licensing revenue suggest that it is more difficult for Canadian researchers to find existing companies interested in their products, confirming the well-documented fact that, in many sectors, there are few companies that have the receptor capacity to commercialize inventions coming from research laboratories. It is often one

of the reasons why Canadian researchers and institutions opt for the creation of spin-off companies to commercialize their research results.

The second part of the report summarizes institutional strategies with respect to commercialization and other benefits to Canada. The reports clearly show that institutions in all parts of Canada are moving aggressively to develop commercialization activities. Some have been in the business for a long time and have quite mature operations, while others are rapidly developing policies and strategies and are examining the best approaches for their institution. Several institutions refer to the Intellectual Property Management Program of the three federal agencies as providing seed money for starting these offices. A number of provincial governments are also actively encouraging the development of commercialization activities in institutions. Many institutions (including colleges) have partnerships with local, national, or even international businesses and are taking steps to reinforce these partnerships.

Several institutions report that they are strengthening their ethics/conflict of interest policies to be quite clear on the role of the investigator in partnerships or spin-off companies, largely around the confidentiality of research results.

In addition to patenting, licensing, and the development of contracts and spin-off companies through industry-liaison offices or arm's length entities, institutions are involved in a substantial number of incubators. The record of successful transitions of companies that have been incubated to listing on the stock market is considerable and growing.

2.9 The CFI as a Major Sponsor of an International Clusters Conference

Technology clusters are the driving force behind economic growth in many Western countries. Clusters consist of concentrations of interdependent, innovative firms that are active in the same industrial sector, are located within a limited geographic radius and around R&D facilities. The world's successful technology clusters are always built upon a university-based core of research excellence that attracts innovators from the private sector. In fact, innovative companies cannot afford not to be present. This is the basis for well-known clusters such as Silicon Valley, Route 128 around Boston, as well as the complexes around Cambridge, England; Tsukubba, Japan; Taejon, Korea; the Research Triangle in North Carolina; Louvain, Belgium; and Singapore. In Canada, it is clear that the activities of the universities, hospitals, and colleges are actively reinforcing and developing clusters in all parts of the country. Some are large, some are small. Some are focused on local opportunities while others are regional or national. Some are attracting significant international attention as magnets for knowledge-based activities. In many cases, of course, these clusters include public laboratories.

With CFI sponsorship and under the aegis of the International Association of University Presidents, the International Association of Universities and the Association of Universities and Colleges of Canada, the Université de Montréal and other Montreal universities are organizing *Clusters 2003*, an international conference on technology clusters. *Clusters 2003* will be held in Montreal on November 7 and 8, 2003. The program of this conference can be found at http://www.congresbcu.com/clusters2003udem/eng/defaulteng.htm.

In light of the importance of geographic proximity in the success of clusters, *Clusters 2003* will bring together university decision-makers and their municipal counterparts, with a view to fostering debate and discussion about best practices with respect to the creation, management, and development of technology clusters

INSTITUTIONAL REPORT: University of Alberta

It is both impressive and instructive to evaluate the impacts that the early CFI awards have had on the conduct and capacity for outstanding research at the University of Alberta. Each has served as leverage and inspiration for other major projects and subsequent awards. Their impact has extended far beyond that envisioned in the original proposals to the CFI. Through interactions between each other and many unanticipated collaborations, they have catalyzed the development of a culture of multidisciplinary research. In short, although the impact of these awards is only beginning to be felt, their benefits are already transformational. A few examples expand on these comments:

Electrical & Computer Engineering Facility (ECERF)—$4.6 million: The CFI is one of several intricately linked initiatives that together have led to a transformation of the research capacity of the Faculty of Engineering. Foremost is the location of the National Institute for Nanotechnology (NINT) at the university. The CFI infrastructure support for the construction of ECERF supported research in all areas of electrical and computer engineering and included the provision of dedicated space for nanofabrication services. This was the critical staging ground for the nanotechnology initiative which culminated in 2001 with the establishment of NINT at the university—a $120 million investment over five years supported by the National Research Council (NRC), the Government of Alberta, and the University of Alberta. NINT will directly employ 150 people with senior scientists having adjunct positions at the University of Alberta. It was a bold move on the part of the University, the Government of Alberta, and the NRC to move forward with the establishment of NINT in Edmonton. It is clear that the CFI commitment to ECERF was catalytic in bringing this national institute to the University of Alberta.

Institute for Biomolecular Design (IBD)—$5.8 million: This 1999 award for IBD catalyzed subsequent Innovation Fund Awards for Innovative Instrumentation for Advanced Proteome Research and to Project CyberCell. The latter award (CFI contribution: $5.5 million) propelled Alberta into a leading position within an international consortium striving to simulate the living Escherichia coli cell in silicon, an extraordinary target at the forefront of proteomics research. IBD co-founded the International E. coli alliance (IECA) in 2002; the other three founding members are E Cell (Japan), EcMCC (U.S.), and Glaxo SmithKline (U.K.). At IECA's second organizational meeting, Great Britain and Germany were added to its membership. The first general conference of the IECA was held in Japan in June 2003. This initiative has attracted major industrial interest ($1 million from IBM to date) and cash commitments. It also helped to spark the establishment of the Alberta Ingenuity Centre for Machine Learning in the Department of Computing Science (a five-year, $7 million provincial commitment). This centre collaborates with Project CyberCell in the interdisciplinary area of bioinformatics.

3. The CFI in the Coming Years

3.1 A New Planning Process

In the context of the National Innovation and Learning Agenda, and with the extension of the CFI's mandate to 2010 and the completion of several program evaluations, the Board of Directors decided to take a more structured approach to planning.

To initiate this process, the CFI management consulted many individuals and groups throughout 2002 and, in early 2003, invited selected members of the broad research community to participate in roundtables to help the CFI identify the major issues that will affect the research environment and capitalize on them for the benefits of Canadians. Subsequently, the Board of Directors held a planning retreat at which it invited a small number of international experts to share their views on planning for research infrastructure in tomorrow's fast evolving research environment.

As a result of this exercise, the Board decided that what was best for CFI was not a formal and complex strategic planning exercise, but rather an ongoing process of policy and program review to ensure that CFI's programs remain at the forefront and can respond quickly to evolving infrastructure needs.

3.2 Objectives for 2003-2004

For the coming year, the CFI has adopted the following planning objectives:

- **Reaching for new heights of excellence and innovation**: Through a rigorous merit review process, the CFI will select a limited number of exceptional infrastructure projects. It will invest up to $450M in projects that will enable institutions to address their research priorities and those of their partners, and to be international leaders in areas of strategic importance to Canada.

- **Attracting and retaining the very best**: Through the provision of infrastructure to first-time faculty at universities and to Canada Research Chairs, the CFI will provide the means for institutions to attract and retain the very best researchers. Expenditures are expected to be in the range of $120M and will support up to 800 researchers.

- **Strengthening infrastructure in research hospitals**: The CFI will design and launch a fund for $500M provided by the Government of Canada in the context of the 2003 Accord on Health Care Renewal, to be committed by 2008. The purpose is to help address the need for further investment in research hospital infrastructure, especially for new and different research space.

- **Maximizing the impact of infrastructure investments**: The CFI will continue to ensure the best use of, and gain the most impact from, investments in infrastructure by approving a contribution of up to $156M for the incremental operating and maintenance costs of new

projects. This will virtually exhaust the CFI's resources for that purpose. Institutions and their researchers must have access to adequate research funding, in particular for operations and maintenance support over the long term. The CFI will continue to interact with key stakeholders, including granting agencies and provincial programs, to find efficient ways to support all aspects of the research enterprise.

- **Sharing results with Canadians**: The CFI will continue to evaluate the impacts of investments in infrastructure. It will work with institutions to develop strategies to communicate the results and impacts of CFI investments in research infrastructure. The CFI will engage the community in discussion on issues related to benefits to Canada, in part through reports on commercialization and cluster development, sponsorships of conferences and workshops, and public announcements.

- **Fostering excellence in management and operations**: The CFI is committed to transparency, integrity, and fairness. As a service organization, it will continue to improve its policies, processes, and products—including information systems, merit review methods, and the corporate website—in consultation with and in response to its clientele. The CFI will conduct audits and maintain proper financial controls for sound financial management. It will continue to identify new ways to practice excellence in governance and corporate responsibility. As an innovative workplace, the CFI will continue to build strong human-resource practices and policies and provide a stimulating training environment for its employees.

- **Planning the future**: As part of its ongoing strategic planning, the CFI will continue to monitor global research trends and set directions accordingly. In consultation with institutions and other stakeholders, the CFI will anticipate the most effective ways of exercising its mandate for the future, with a particular focus on the period beyond 2005.

3.3 Major Challenges for the Future

International Competitiveness of Canadian Research
Research in this country is becoming internationally competitive. In recent years, federal investments have strengthened all the building blocks of a healthy research environment, both for institutions and for their researchers. Provincial governments have recognized the importance of investments in research and research infrastructure. Not only have they contributed to infrastructure projects, but many have also developed new programs and strategies in support of research and research training.

The instruments created are now contributing to all elements of the cost of research:

- Financial support to attract the best graduate students;
- Incentives to attract and retain high quality researchers;
- Payment of the indirect costs of research to institutions;
- Support for the development, acquisition, operation, and renewal of research infrastructure;
- Support for the direct costs of research.

These elements, or building blocks, are complementary. At a time when institutions are recruiting a whole new generation of very capable researchers, these elements ensure that we can realize the potential created by the availability of state-of-the-art infrastructure. Investments in the direct costs of research through the granting agencies and other foundations, in the indirect costs of research, in human infrastructure through Canada Research Chairs, and graduate student support need to be sustained if we are to ensure maximum returns for the country.

Two areas of particular concern with respect to the CFI have been discussed by the Finance Committee and other committees: ensuring that smaller institutions and institutions in Atlantic Canada compete on a level playing field. As discussed in section 1.4, the CFI has taken several initiatives to ensure that colleges and smaller universities can be competitive and provincial governments in Atlantic Canada have recently created funds to ensure that their institutions are competitive.

Sustainability of the CFI Investment

According to recent evaluations of the CFI programs, there is every indication that ongoing need for infrastructure investments remains high and is increasing. In fact, the enthusiastic response to the fourth competition for the Innovation Fund and the Research Hospital Fund confirms this.

At the same time, research itself is changing, moving faster and faster and requiring more and more sophisticated infrastructure. The research community is expanding and will need new infrastructure to maintain the momentum. Equipment becomes obsolete very quickly and ongoing investment is essential to remain at the forefront.

A report on the state of infrastructure in the U.S. published by the National Science Board reached the same conclusions.

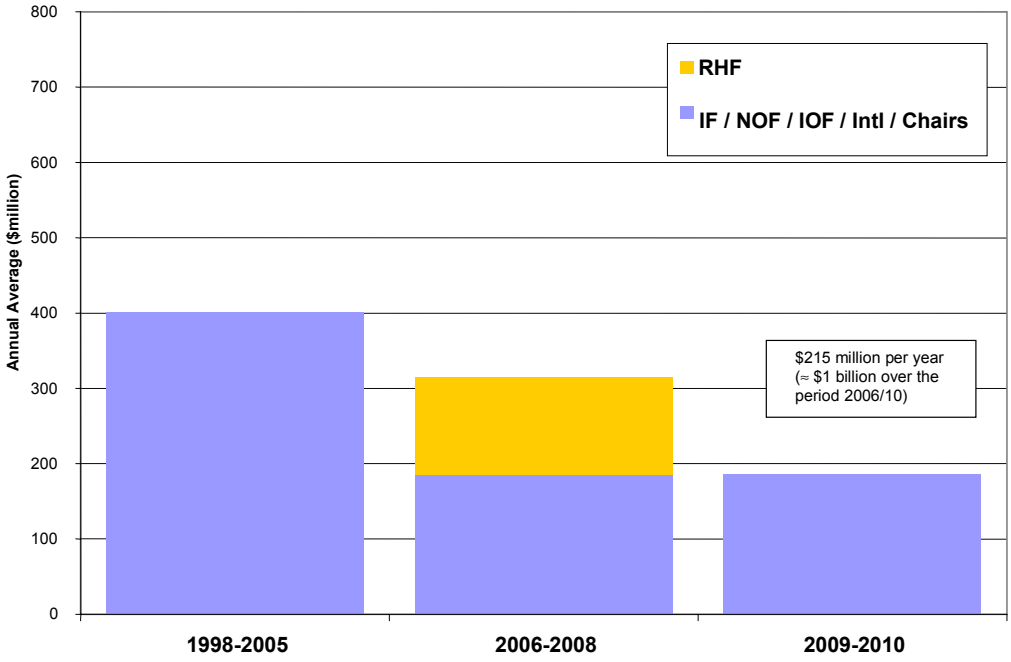
Yet, under current projections, the CFI will not have the resources necessary to help institutions maintain the momentum, as shown in Figures 4 and 5. Per year, between 2006 and 2010, the CFI will be left with less than 60% of the investment per year between 1998 and 2005.

FIGURE 4

Committed and Projected Amounts ($M) 1998-2010

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total Per Fund ($M)
New Opportunities Fund	37.9	23.5	36.7	37.6	54.1	218			156				563.8
University Research Development Fund	19.2	10.3	2.7	2.4	0.5								35.1
Innovation Fund	143.3	224.8	358.6	592.6	–	450							1,769.3
College Research Development Fund		7.3	8.5		–								15.8
Canada Research Chairs Infrastructure Fund			5.3	54.2	35.8	155			No additional funds				250.3
International Funds					163.6	36.4 to be allocated		No additional funds					200
Career Awards					1.9	2	2						5.9
Research Hospital Fund					–	100		400					500
Infrastructure Operating Fund				184.1	16.2	199.7			No additional funds				400
Unallocated Amounts					–			760					760
Total ($M)	200.4	265.9	411.8	870.9	272.1	2,479.1							4,500.2

FIGURE 5 - Average Annual Commitments by the CFI—1998-2010



Moreover, the Infrastructure Operating Fund ends in 2005, leaving institutions with no dedicated resources for ensuring the operation, maintenance, and upgrading of the large infrastructure investment made during the previous seven years.

The Canada Research Chairs Infrastructure Fund also ends in 2005, which means that there is no provision for infrastructure support of the new incumbents that will be recruited as the original Chair Holders complete their mandate.

The Research Hospital Fund ends in 2008.

The CFI estimates that, at a minimum, an additional investment of $1B (or $2.5B when counting partner investments) between 2006 and 2010 would help maintain the momentum and ensure the full and effective utilization of research infrastructure.

Benefits to Canada

The provision of benefits to Canada is one of the three criteria used by the CFI to assess proposed infrastructure projects. Direct benefits arising from research supported by CFI infrastructure are occurring now, but more will continue to accrue over the longer term, given the time required for infrastructure development and acquisition, and given the nature of research itself. All indicators point in the right direction and there is no question that CFI investment is generating benefits to Canada in terms of training of highly qualified personnel on state-of-the-art equipment, the commercialization of research results, the translation of results in medical practice, as well as improvements to the environment and to the quality of life in Canada. The

CFI is working with institutions, the research community, and other partners to develop more systematic ways of assessing and documenting the research accomplished and the benefits to Canada that result from this research.

INSTITUTIONAL REPORT: The University of Regina

The Environmental Quality Analysis Laboratory (EQAL) has been an important factor in the soon-to-be announced collaborative venture, the *Communities of Tomorrow (CoT)* between the National Research Council, City of Regina and Regina Regional Economic Development Association, and the University of Regina. The CoT is a five-year, $30 million investment to develop Regina as a centre of excellence for work on sustainable communities. The CoT's mandate is to develop new information and technologies essential for sustaining urban infrastructure. EQAL will be essential to researchers studying the management and sustainability of water resources in urban communities. It is expected that the Communities of Tomorrow will enable Canada and Canadian industry to take a leadership role in the development of more socially, economically, and environmentally sustainable municipalities.

Appendix 1
Annexe 1

Projects Approved by the CFI (Cumulative to June 25, 2003)
Projets approuvés par la FCI (cumulatif au 25 juin 2003)

Institution / Établissement	Maximum CFI Contribution / Contribution maximale de la FCI	# of projects / # de projets
B.C. Cancer Research Centre	$27,800,000	1
British Columbia Institute of Technology	$639,990	3
Forintek Canada Corp.	$1,362,000	2
Malaspina University-College	$1,775,744	4
Okanagan University College	$978,813	7
Open Learning Agency	$514,000	1
Royal Roads University	$250,000	2
Selkirk College	$543,756	1
Simon Fraser University	$14,742,802	50
University College of the Cariboo	$250,000	1
University of British Columbia	$157,132,274	189
University of Northern British Columbia	$2,133,019	10
University of Victoria	$18,237,377	53
Vancouver Aquarium Marine Science Centre	$617,859	1
Total - British Columbia / Colombie-Britannique	**$226,977,634**	**325**
Athabasca University	$704,566	5
King's University Collge (The)	$298,708	2
Lethbridge Community College	$716,740	1
Olds College	$1,807,727	4
Southern Alberta Institute of Technology	$406,400	1
TRLabs	$3,727,387	1
University of Alberta	$122,320,183	174
University of Calgary	$48,103,983	110
University of Lethbridge	$2,107,602	8
Total - Alberta	**$180,193,296**	**306**
Saskatchewan Indian Federated College	$351,924	1
University of Regina	$5,892,242	22
University of Saskatchewan	$38,307,252	70
Total - Saskatchewan	**$44,551,418**	**93**
Brandon University	$888,196	5
Red River College of Applied Arts, Science and Tech.	$550,788	1
St. Boniface General Hospital	$1,050,809	2
University of Manitoba	$26,283,305	94
University of Winnipeg	$1,029,776	6
Total - Manitoba	**$29,802,874**	**108**
Algonquin College of Applied Arts and Technology	$781,244	1
Baycrest Centre for Geriatric Care	$10,712,000	1
Brock University	$3,236,035	18
Carleton University	$17,014,806	40
Fanshawe College	$369,473	2
Lakehead University	$2,981,940	25
Laurentian University / Université Laurentienne	$2,847,389	14
London Health Sciences Centre	$3,196,857	1
London Regional Cancer Center	$211,500	1
McMaster University	$53,257,613	120
Mount Sinai Hospital	$25,348,819	4
Niagara College	$797,110	1
Perimeter Institute for Theoretical Physics	$5,624,892	1
Queen's University	$37,461,271	86
Robarts Research Institute	$4,890,982	3
Royal Military College of Canada / Collège militaire royal du Canada	$175,000	2
Ryerson University	$3,031,251	23
Sault College	$1,532,535	3
Seneca College	$676,035	2
Sheridan College	$1,584,492	3
Sir Sandford Fleming College	$1,060,487	2
St. Joseph's Health Centre of London	$2,864,000	1
St. Joseph's Hospital (Hamilton)	$11,262,736	2
St. Michael's Hospital	$3,520,595	2
Sunnybrook and Women's College Hlth Sc. Centre	$16,597,506	4

Institution / Établissement	Maximum CFI Contribution / Contribution maximale de la FCI	# of projects / # de projets
The Hospital for Sick Children	$9,657,115	4
Trent University	$4,435,918	16
University Health Network	$10,028,757	3
University of Guelph	$45,136,835	76
University of Ottawa / Université d'Ottawa	$55,554,696	93
University of Toronto	$121,938,502	227
University of Waterloo	$44,177,167	88
University of Western Ontario	$57,024,850	98
University of Windsor	$6,577,262	37
Wilfrid Laurier University	$6,382,101	25
York University	$10,810,456	46
Total - Ontario	**$582,760,227**	**1,075**
Bishop's University	$164,595	2
CÉGEP de Chicoutimi	$152,119	1
CÉGEP de La Pocatière	$957,360	2
CÉGEP de l'Abitibi-Témiscamingue	$594,000	1
CÉGEP de Lévis-Lauzon	$1,017,104	2
CÉGEP de Rimouski	$204,000	1
CÉGEP de St-Hyacinthe	$879,960	2
CÉGEP de Trois-Rivières	$1,300,368	3
CÉGEP Vanier College	$140,170	1
Collège de Maisonneuve	$108,455	2
Collège Shawinigan	$683,000	2
Concordia University	$20,824,542	27
École Polytechnique de Montréal	$37,123,905	24
HEC Montréal	$1,436,079	2
Institut Tech Agro-Alim de La Pocatière	$52,700	1
Institut Tech Agro-Alim de St-Hyacinthe	$879,597	1
McGill University	$140,988,879	165
Université de Montréal	$84,103,270	174
Université de Sherbrooke	$17,362,278	52
Université du QC École de technologie supérieure	$5,317,831	12
Université du QC INRS	$20,769,600	29
Université du Québec à Chicoutimi	$2,652,528	11
Université du Québec en Outaouais	$1,507,748	8
Université du Québec à Montréal	$4,772,718	25
Université du Québec à Rimouski	$7,137,489	8
Université du Québec à Trois-Rivières	$5,294,276	16
Université du Québec en Abitibi-Témiscamingue	$1,519,163	4
Université du Québec Télé-université	$1,389,876	4
Université Laval	$127,282,608	130
Total - Québec	**$486,616,218**	**712**
Collège communautaire du Nouveau-Brunswick	$187,338	1
Mount Allison University	$1,481,282	6
St. Thomas University	$249,975	1
Université de Moncton	$1,657,557	10
University of New Brunswick	$7,614,940	39
Total - New Brunswick / Nouveau-Brunswick	**$11,191,092**	**57**
Acadia University	$1,290,279	5
Dalhousie University	$19,860,675	75
Mount Saint Vincent University	$345,591	4
Nova Scotia Agricultural College	$4,168,927	12
Nova Scotia Community College	$1,115,000	2
Saint Mary's University	$1,461,090	9
St. Francis Xavier University	$1,213,571	7
University College of Cape Breton	$581,651	5
Total - Nova Scotia / Nouvelle-Écosse	**$30,036,784**	**119**
University of Prince Edward Island	$4,784,931	12
Total - Prince Edward Island / Ile-du-Prince-Edouard	**$4,784,931**	**12**
College of the North Atlantic	$670,060	1
Marine Institute	$350,000	1
Memorial University of Newfoundland	$12,763,290	42
Total - Newfoundland and Labrador / Terre-Neuve-et-Labrador	**$13,783,350**	**44**
Total - All provinces / Toutes les provinces	**$1,610,697,824**	**2,851**
National "System-on-Chip" Research Network / Réseau canadien de recherche du système sur puce	$15,892,932	1

Institution / Établissement	Maximum CFI Contribution / Contribution maximale de la FCI	# of projects / # de projets
Canadian Light Source / Centre canadien de rayonnement synchrotron	$56,400,000	1
National Site Licensing Project / Projet national de licences de sites	$20,000,000	1
National Microelectronics and Photonics Testing Collaboratory / Laboratoire national collectif d'essais en microélectronique et en photonique	$9,310,238	1
National Solid State Ultrahigh Field NMR Facility / Installation nationale de résonance magnétique nucléaire (RMN) à ultra-haute résolution en phase solide	$4,440,300	1
Research Data Centres / Centre d'accès aux données de recherche	$5,380,089	1
Text Analysis Portal for Research (TAPoR) / Portail d'analyse textuelle de recherche (PATeR)	$2,629,223	1
Total - Canada National Projects / Projets nationaux	**$114,052,782**	**7**
Total - Infrastructure projects / Projets d'infrastructure	**$1,724,750,606**	**2,858**
Infrastructure Operating Fund – Maximum Allocation ** / Fonds d'exploitation des infrastructures - enveloppe maximale **	**$210,359,969**	
Grand Total	**$1,935,110,575**	**2,858**

* This allocation represents 30% of the maximum CFI contribution for projects approved starting July 2001 under the Innovation Fund and the New Opportunities Fund.
* Cette enveloppe se chiffre à 30 pour cent de la contribution maximale de la FCI à des projets approuvés à partir de juillet 2001 dans le cadre du Fonds d'innovation et du Fonds de relève.

Appendix 2

CFI Investments by Thematic Area

Category/Theme	Number of Projects	M$
1. Biotechnology for Health		
Genomics, proteomics, bioinformatics, stem cells, protein crystallography, protein expression, human, animal, plant	110	19.1
Pharmaceuticals, therapeutics	33	3.8
Cardiovascular	22	3.6
Cancer	28	4.6
Infectious diseases, vaccines and viruses, inflammatory diseases	37	8.1
Neuroscience, brain research, cognitive science	46	5.1
Clinical, translational, surgery	84	15.0
Epidemiology, population health, healthy life styles, health promotion, workplace health and safety, determinants of health	86	13.1
E-health	8	0.7
Disability and Aging, spinal cord, rehabilitation, hearing, speech, vision, gait and mobility, pain management, mental health, elderly life style and support	50	7.3
Imaging, medical imaging, biological imaging, materials science, astronomy	86	8.4
2. Information Science Technologies		
High performance computing, campus networks	43	4.9
Robotics, biorobotics, surgery, medical, ocean, mining, development, intelligent machines	25	2.7
Microelectronics	11	0.9
Photonics, lasers, optoelectronics, biophotonics, plasma	18	3.3
Telecommunications and wireless	41	3.1
Visualization, graphics and software	35	3.5
New media	30	3.5
Geomatics, geohazards	20	1.8
3. Nanotechnologies and Nanosciences, knowledge-based multifunctional materials and new production processes and devices		
Materials, biomaterials, soft materials, composites, metals, electronic, surfaces, thin films, smart materials, polymers	113	10.6
Nanoscience and nanotechnology	34	3.3
Manufacturing and Industrial Processes	72	9.3
4. Aeronautics and Space		
Aerospace and space	25	2.2
Astronomy and astrophysics	16	3.8
5. Food Quality and Safety		
Food and Agriculture, agriculture, livestock, aquaculture and fisheries, food, food safety, nutrition, nutraceuticals and functional foods	80	8.0
6. Sustainable Development, Global Change and Ecosystems		
Biodiversity, Ecology, Evolution and Conservation Biology, wildlife, forests, aquatic and marine life, insects, microbes, plants, evolutionary biology, modelling, research field stations, landscape, ecology, ecotoxicology, conservation biology	53	4.2
Energy, exploration, petroleum reservoir, oil sands/heavy oil, electricity, alternate energy, conservation	44	2.9
Greenhouse gases, reduction, sequestration	8	0.4

Oceans and Marine, research platforms, physical oceanography, chemical and isotope analysis, subsea studies, fisheries oceanography, marine archaeology	13	0.9
Air, Air Quality and Atmosphere, paleoclimates, modelling climate change, atmospheric pollutants, observation and monitoring, transport and flow of pollutants, aerosols, air-sea boundary, air-land boundary	20	0.9
Water, Water Quality and Solid Wastes, water monitoring, pollutants, remediation, water in the ecosystem	50	4.1
North/Arctic	29	1.8
7. Citizens and Governance		
Social Sciences and Humanities, e-commerce, education, art and archaeology, politics, library databases, history, language and linguistics, urban and regional, justice and ethics, cultural studies	128	14.9
Aboriginal studies	14	0.7
8. Other		
Forestry, wood, wood products, pulp and paper	27	1.7
Mining, mineral and metallurgy	12	0.7
Civil Works, physical infrastructure, design	27	2.2
Simulation, modelling	31	2.7
Mathematics and theoretical physics	7	0.8
Automotive	11	0.7