

**SCIENTIFIC AND TECHNOLOGICAL CULTURE,  
AN INTERFACE BETWEEN SCIENCE, TECHNOLOGY, AND SOCIETY**

**2004 SITUATION REPORT**

## Summary

The work of Conseil de la science et de la technologie (CST) on scientific and technological culture is part of a broader examination of the relationships between science, technology, and society. This situation report draws upon previous work, notably the assessment of scientific and technological culture, the Québec public opinion survey, and the comparative study of scientific and technological culture policies published in November 2002. The orientations and the portrait of the situation contained in the assessment were validated at consultations held in spring 2003 with stakeholder communities.

Through this process, CST has identified five goals for developing scientific and technological culture in Québec:

- Recognize the contribution of scientific and technological culture to strengthening the links between science, technology, and society
- Democratize scientific and technological culture
- Strengthen the teaching of science and technology in schools
- Rethink the relationship between the scientific community and the general public
- Increase our knowledge of scientific and technological culture

### **Recognizing the contribution of scientific and technological culture**

Scientific and technological progress—and the social and economic development of society at large—is increasingly dependent on better awareness in society of the world of science and technology. The development of scientific and technological culture as an interface between these three elements is crucial in this regard. Given the strategic importance of scientific culture and the persistent lag in the public’s ability to keep pace with scientific and technological advances, numerous governments have reaffirmed the central role of scientific and technological culture in their science policies.

Québec has long supported scientific and technological culture. Yet despite the progress of the past twenty years, accessibility objectives are still far from being met. Québec’s current level of scientific and technological culture appears insufficient to meet current challenges. Furthermore, this culture is very unequally distributed among the population.

To bolster scientific and technological culture in all sectors of the population, Québec needs to pursue its efforts. As a result, Ministère du Développement économique et régional (MDER) must reaffirm its leadership role as the government department responsible for scientific and technological culture in Québec, while at the same time adjusting funding mechanisms and levels to take into account a changing situation. Scientific and technological culture has grown in

importance. New organizations are springing up in the field, partners are more diverse, and there are increasing calls for more in-depth analysis of the social impacts of new technology, more participation in public debate on various issues, more consideration of ethical questions, etc.

To promote a broad-brush approach, MDER therefore needs to review its support measures for scientific and technological culture. To maximize results, government strategy must be capable of mobilizing numerous stakeholders.

**Recommendation 1 - Conseil de la science et de la technologie recommends that the Minister of Economic and Regional Development reaffirm his responsibility for scientific and technological culture. To do so, he must**

- **Draw up a government action strategy that reflects his commitment and leadership in promoting scientific and technological culture. This strategy, developed in cooperation with MDER partners, must include the following priorities:**
  - ✓ **Enhance the level of scientific and technological culture in all regions of Québec**
  - ✓ **Better each groups with unmet needs, including the socially and economically disadvantaged, certain groups of young people, adults, etc.**
- **Issue an official statement on the importance of scientific and technological culture in a knowledge-based society and ensure its widespread public distribution**
- **Coordinate initiatives by other government players around the action strategy**
- **Provide key players with some \$3.5 million in financial support**
- **Merge existing project-oriented funding programs in order to increase support for core programs**
- **See that support for scientific and technological culture core programs increases to at least \$6 million within five years**
- **Conclude an agreement with the Canadian government on funding for core Québec programs in scientific and technological culture in exchange for considerations**
- **Team up with other Québec government organizations to provide \$3 million in additional funding over five years for media production, promotion of public library science and technology resources, and promotion of scientific and technological culture through use of materials in the classroom**

### **Democratizing scientific and technological culture**

Over time, the number of organizations and initiatives in the area of scientific and technological culture has multiplied throughout Québec. Today, there are between 150 and 200 organizations active in this area. Their efforts are backed by initiatives from a growing number of partners. As a result of this expansion, the need for dialog and concerted action is greater than ever.

Using a variety of channels, materials, and approaches, these organizations target both the general public and specific groups. Their goal is to counter the ongoing image problem science and technology face by making science more visible and portraying it in a more balanced way. The media plays a major role in this regard, especially television, which reaches a wide audience. Making scientific and technological information more available to the general public also means harnessing the full potential of public libraries, museums, and other public facilities.

In the case of groups with unmet needs, organizations promoting scientific and technological culture need to adjust their approaches to meet special requirements and objectives. Without neglecting efforts to stimulate interest among youth, steps must be taken to address new challenges, like encouraging greater involvement in public debates by fostering a citizen's conscience among adults. Models and measures ineffective in reaching the socially and economically disadvantaged, many of whom who are excluded from scientific and technological culture, must be overhauled, and new avenues explored. One potential avenue is to encourage well-established community groups and networks to get involved in promoting scientific and technological culture with a view to developing new ties of solidarity at the local and regional levels.

**Recommendation 2 – CST recommends that organizations involved in scientific and technological culture establish a forum to foster synergy between organizations and partners, and harmonize their efforts to democratize access to scientific and technical culture. The goal of these initiatives would be in keeping with the government's action strategy:**

- **Enhance the level of scientific and technological culture in all regions of Québec**
- **Reach groups with unmet needs, including the socially and economically disadvantaged, certain groups of young people, adults, etc.**

### **Strengthening the teaching of science and technology in schools**

Schools are the primary tool for democratizing scientific and technological culture, but have been widely criticized for how they teach science and technology and the time they spend doing so.

CST believes that the education reform launched in 1998 will address some of these weaknesses and encourages Ministère de l'Éducation (MEQ) to pursue its efforts, while at the same time reaffirming the importance of science and technology in a child's education.

Science and technology play a major role in how our society functions, a role reflected only poorly in today's primary and secondary school curricula. Contemporary societies like Québec are ambitiously raising their educational objectives to meet the growing demands of modern life and the modern workplace. We must therefore ensure students receive the scientific and technological training they need to live successfully in the knowledge-based society, no matter what career they choose.

Time spent on basic schooling has increased over the years. Scientific knowledge and skills—including in the social sciences and humanities—must be part of that basic training. For this reason, CST believes that there should be more emphasis on science and technology throughout the years of basic schooling, from preschool through college, and in the new adult general education program.

If the reform is to deliver its full promise and science and technology assume their rightful place, teaching practices have to change. Change means implementing new, more stimulating and effective approaches to teaching. It also requires suitable training for science and technology teachers at the primary level—where many feel ill at ease with the subject matter—and at the secondary level, where questions have been raised about whether current discipline-specific training is sufficient.

In keeping with the reform, schools are also expected to develop closer ties with community partners, another way to boost the presence of science and technology in the classroom. Schools and school boards need MEQ support for this purpose. Not only can organizations involved in scientific and technological culture provide additional material, they can also influence how these disciplines are taught in a changing school system.

### **Recommendation 3 - Conseil de la science et de la technologie recommends that the Minister of Education**

- **Strengthen science and technology knowledge and skills acquisition from preschool through to college, regardless of children’s career orientations, by taking the following steps:**
  - **Ensure that teachers and teachers in training receive a solid grounding in science and technology by seeing that**
    - ✓ **They receive more comprehensive training in the scientific disciplines**
    - ✓ **Training places greater emphasis on developing stimulating and effective teaching approaches that are more appropriate to scientific and technological disciplines**
  - **Support cooperation between educators and community partners in order to give science and technology the place they deserve in school activities, while at the same time ensuring staff have the time and resources they need for this purpose:**
    - ✓ **Document resources**
    - ✓ **Experiment zones**
    - ✓ **Science and technology projects**
  - **Provide school boards and schools with sufficient resources to support innovative local science and technology initiatives**

- **Strengthen the role of science and technology in the new adult general education program currently under development to ensure that target clientele—and especially young adults—acquire the knowledge and skills they need to fulfill the various social roles they are called on to play (parent, worker, citizen, etc.)**

### **Rethinking the relationships between the scientific community and the general public**

The relationship between the scientific community and the general public is a strategic aspect of the movement to build bridges between science and technology and society as a whole. In Québec, however, bridge building remains an arduous process in both directions. The bidirectional aspect of this process marks a new approach to science/society dynamics that portends a major interface role for scientific and technological culture.

Production of knowledge is increasingly reliant on interactions between actors, including between experts and lay people. On one hand, these interactions help the public better understand the goals and objectives of scientific and technological development. On the other hand, they expose scientists to new perspectives and ways of thinking that may enrich their work. In short, close ties between scientists and the population generate research results more closely attuned to public needs.

To foster this dialog, scientists must be encouraged to get more involved. The possibilities for this are many and include showcasing homegrown science and technology expertise in the media, teaching scientists how to popularize and communicate their knowledge, and forging alliances between scientists and organizations active in the area of scientific and technological culture.

But improving the relationship between society and science and technology also means encouraging public feedback. It would therefore be advisable to establish interface mechanisms—consultations, debates, science boutiques—to help channel public requirements with regard to research and research policy. Non-expert contributions could also be channeled through partnerships with a view to joint production of knowledge. Such research partnerships have multiplied in recent years and now tend to include non-scientific contributors and social groups.

Without appropriate institutional support, however, dialog between knowledge producers and the public will remain sporadic at best. This is why CST is counting on support from academic and research institutions and grant agencies, all of which have a major role to play in fostering closer ties between science and technology researchers and the general public.

**Recommendation 4 - Conseil de la science et de la technologie recommends that academic and research institutions, including colleges and college technology transfer centers,**

- **Make building bridges between society and science and technology a more important part of the strategic planning process as well as a criterion for staff evaluation. Possible means include**

- **Developing mechanisms for dialog (debates, consultations, science boutiques, etc.) that provide scientists more opportunities to interact with the public**
  - **Having staff participate in community activities related to scientific and technological culture (mentoring, talks, youth internships, etc.)**
  - **Disseminating scientific knowledge to a lay audience through the media, including the Internet**
  - **Helping scientists and students learn how to popularize their knowledge**
  - **Fostering partnerships between scientists and organizations involved in scientific and technological culture**
  - **Adding courses on scientific and technological communication to journalism, communications, and library sciences programs**
- **Increase support for collaborative research targeting technological, organizational, and social innovation**

**Recommendation 5 - Conseil de la science et de la technologie recommends that the three Québec grant agencies**

- **Oblige research teams to incorporate bridge-building activities between society and science and technology into their research proposals and make such activities part of application evaluation criteria: Possible activities include**
- **Developing mechanisms for dialog (debates, consultations, science boutiques, etc.) that provide scientists more opportunities to interact with the public**
  - **Having researchers participate in community activities related to scientific and technological culture (mentoring, talks, youth internships, etc.)**
  - **Building partnerships between scientists and organizations involved in scientific and technological culture**
  - **Disseminating scientific knowledge to a lay audience through the media, including the Internet**
  - **Helping scientists and students learn how to popularize their knowledge, no matter what their discipline**
- **Fund research aimed at better understanding scientific and technological culture**
- **Increase support for collaborative research targeting technological, organizational, and social innovation.**

**Increasing our knowledge of scientific and technological culture**

The goal of reflecting on the various aspects of scientific and technological culture is to take more effective action. Yet a number of these aspects remain largely or totally unexplored, including the economic and social impact of scientific and technological culture, youth interest, and popular representations of science and technology.

In order to measure the progress of scientific and technological culture in Québec and identify the changing relationships between society and science and technology, a complete set of relevant indicators is required. Research on scientific and technological culture is required to achieve the goals of democratizing access and reaching groups with unmet needs. It allows us to understand special needs, assess the relevancy of approaches used, and pinpoint emerging concerns.

**Recommendation 6 - Conseil de la science et de la technologie recommends that the Minister of Economic and Regional Development ask Observatoire-réseau du système d'innovation québécois (ORSIQ) to**

- **Upgrade the *Québec Innovation System Trend Chart* in order to efficiently monitor the development of scientific and technological culture**
- **Conduct a survey every five years measuring the progress of scientific and technological culture within Québec's population, improving it as required**
- **Conduct a survey of scientific and technological culture among high school students in order to measure their progress subsequent to implementation of the reform**

## 8. Review and strengthen government support for scientific culture

At the same time that MDER reaffirms its commitment to scientific and technological culture, it must also ensure that sufficient resources are made available to achieve the goals that have been set. As part of its government action strategy, MDER will review funding mechanisms and levels to meet current needs more effectively.

With the inclusive approach adopted to deal with the development of scientific and technological culture, CST is turning to other actors for support. Anticipated additional investments from these sources could have a major impact on target groups. In the long run, initiatives by partners like MEQ, academic and research institutions, and grant agencies will also lead to fundamental changes in actor awareness and the way things are done. For the moment, however, the recommendations in this chapter refer solely to the transfer budgets of the government department responsible for scientific and technological culture.

CST believes that an increase in MDER transfer budgets is in order. Such an increase would make it possible to achieve the full creative potential of scientific and technological culture while at the same time taking the Québec government's ability to fund into account. The sole purpose of the CST assessment is to suggest ballpark funding requirements for scientific and technological culture, leaving detailed estimates to MDER based on available resources and real capacity for development on the ground.

Over the past twenty years, the Québec government has regularly funded community initiatives in the area of scientific and technological culture. However, the financial viability of the organizations involved remains precarious, and their influence limited. Furthermore, demand for their services has increased as new needs emerge. Public support is still crucial to their ongoing survival.

Appendix 3 shows the evolution of scientific and technological culture transfer budgets since the mid 1990s. In 1995–1996, the budget of the department responsible for the file was \$5.2 million in recurrent expenditures. In 2001–2002, the combined budget of the two departments responsible was \$5.6 million, an amount that remained largely unchanged in 2002–2003, at \$5.5 million. Subsequent budget cuts in the summer of 2003 saw the MDER budget for scientific and technological culture drop to \$4.7 million for 2003–2004, a significant decrease that stakeholders warn will threaten the long-term survival of organizations active in the field.<sup>1</sup>

The financial needs of organizations in the area of scientific and technological culture are difficult to measure.<sup>2</sup> Data available from other provinces and countries is partial at best and too limited to permit comparisons beyond the scope of the society that generated it. Government investments in various programs cannot be assessed without also examining aspects like the importance of science at school, the role of municipalities and other local and regional bodies in

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<sup>1</sup> Burgun, I., “C’est catastrophique!,” dossier Coupures 2003, July 3, 2003, *La toile scientifique* [www.sciencepourtous.qc.ca] (September 2003).

<sup>2</sup> Science pour tous, “Prise de position du CA de Science pour tous sur la création d’un fonds ou d’un conseil qui financerait les activités de culture scientifique et technique,” *La toile scientifique*, September 2000 [www.sciencepourtous.qc.ca] (February 2004).

promoting scientific culture, R&D investment capability, and even language, which can constitute a barrier to accessing scientific material from abroad, as it does in Québec.

## 8.1 Increase support for key organizations

Twenty-seven organizations recognized as major players and organizers of major science and technology events receive recurrent funding on account of the scope of their work, their dynamism, and the key position they occupy in their respective fields of activity. They are listed in Appendix 1. In 2003–2004, these organizations received \$2.4 million in MDER funding, 51% of the departmental budget for scientific and technological culture. As the transfer budget table in Appendix 3 shows, only five of them receive annual grants over \$100,000. Given the strategic importance of scientific and technological culture, these amounts are miniscule in comparison to what the Québec government spends on education (\$11.1 billion in 2002–2003).

With the transfer of responsibility for scientific and technological culture from MCC to MDER and the development of the planned action strategy (see Section 3.1.1), MDER will have to review its list of key organizations and all its departmental initiatives in this area. The review will need to look at the number of organizations recognized as key players, their share of budgets, the areas covered, and the mechanisms of support.

The scientific and technological culture sector needs organizations that serve as models and pioneers for everyone in the field. Various key organizations not only provide leadership at the provincial level, they also work with stakeholders in the community to help develop local and regional strategies. This leadership role stems from the multi-year funding they receive from the Québec government, crucial support that testifies to the quality of their work and helps ensure their organizational stability.

Certain key organizations, along with the activities they oversee, have not seen their budgets adjusted in a decade for increases in the cost of living, as the table in Appendix 3 shows. Their responsibilities have also tended to increase over this period, along with the size of their clientele, increasing demand for their products and services at the same time that the volunteer workers they rely on become less available.

These organizations have developed extensive expertise in their respective fields, but require resources to adapt to new needs. The experimental activities and science and technology monitoring necessary to keep pace with developments in scientific culture and to reach out to new audiences cannot be completed out without proper support. In these conditions, it would be advisable to increase organization funding to levels more commensurate with their responsibilities and that take into account levels of inflation since 1994 (\$400,000).

In light of new demands in the area scientific and technological culture—whether for promoting and hosting public debates or making science and technology part of the community organizational dynamic—MDER has much to gain by entrusting these new responsibilities to new or existing organizations, along with stable funding (\$500,000). Overall, CST believes that

support for key organizations should be increased from the \$2.4 million allocated in 2003–2004 to \$3.5 million in the short term, including *Prix du Québec*. The Council therefore recommends:

**That MDER allocate approximately \$3.5 million in funding to key organizations**

## 8.2 Support for core programs

Financial assistance for scientific and technological culture goes primarily to special projects such as new product development and dissemination initiatives. This type of support accounted for 45.8% of MDER's budget for scientific and technological culture in 2003–2004. Appendix 2 shows the number of projects funded and the monies allocated under the *Étalez votre science* and *Aide à la relève en science et technologie* programs. Although this funding approach stimulates creativity and new ventures on the part of organizations involved in scientific and technological culture, it does little to consolidate organizational structure, leaving them in a situation of chronic financial uncertainty.

Sales of products and services generate some revenues, but their limited potential is quickly attained, and is insufficient as a long-term funding source. Sponsorships, too, are ad hoc and complementary in nature. As a result, fundraising and partnership development often consumes too much energy.

Québec's predilection for funding special projects in the scientific culture field limits project sustainability and renewal. CST believes the approach should be overhauled to encourage project continuity, while at the same time continuing to encourage new approaches and models that help ensure scientific culture is accessible to all segments of the population. As a result, CST recommends that

**MDER consolidate its existing project grant programs (*Étalez votre science* and *Aide à la relève en science et technologie*) and shift the focus to core program support**

This support, combined with MDER's forthcoming government action strategy, will make it possible to support regional and theme-based initiatives (e.g., in cultural tourism, technical trades, youth programs, health, family, continuing education, labor force renewal, sustainable development, initiatives for girls, highly skilled labor) that are built on dialog and meet the needs of target groups identified by stakeholders. Drawing in part on the project model used by the *Aide à la relève en science et technologie* program, three to five-year activity programs will be developed in partnership with stakeholders that have an interest in specific themes (schools, school boards, businesses, organizations involved in scientific culture, the scientific community, community groups). These programs, which will take local and regional particularities into account, will be broader in scope than special projects. They could, for example, be divided into components, each under the responsibility of different organizations working together to meet a common need.

An approach like this, which seeks to harness scientific culture in the public interest, is likely to mobilize more stakeholders around unifying themes and help make this culture part of the local and regional dynamic. Support for long-term programming is a true tool for democratizing scientific and technological culture when target group needs get this level of attention. Pending the funding mechanism overhaul, however, CST believes that it would be advisable to maintain current programs so as not to interfere with existing activities.

Estimated  
investment  
requirements

The investment required to support popular science and technology activities in Québec can be assessed by looking at grant applications submitted under existing programs in order to evaluate current capabilities in the area of scientific culture projects. Data for recent years shows that the *Étalez votre science* program funded one-third of the projects submitted.

To award grants for all the quality projects submitted to *Étalez votre science*—a proportion estimated at 60% of the total—we would need to double the 1995–1996 program budget (\$1.8 million) and factor in a cost-of-living increase for the intervening years (\$600,000), for a total of \$4.2 million. Adding this amount to the *Aide à la relève en science et technologie* budget for 2002–2003 (\$1.9 million), which provides funding for two-thirds of the projects presented, brings the core program support budget to about \$6 million.

This amount may seem high compared to the \$3 million allocated to the two funding programs in 2002–2003, but we need to take into account the funding requirements for the new responsibilities identified in this report: organization networking and consultation, involvement of new partners (notably community groups), adjustments to meet the special needs of hard-to-reach groups, more involvement by scientists, etc.

gradual  
increase in  
budgets

CST believes that new resources should be made available in a way that takes into account time requirements for project development and the current climate of financial restraint. Developing new models for action, adapting approaches, and building crucial partnerships takes time and preparation. It would therefore be wise to envisage a gradual increase in core program to ensure that future initiatives in the area of scientific and technological culture meet the highest standards of quality. In consequence, CST recommends that

**MDER ensure that funding for core programs in the area of scientific and technological culture be increased to at least \$6 million within five years**

increasing  
Federal  
government  
involvement

Despite its emphasis on promoting science and technology awareness, the Canadian government decided not to renew funding for science and technology culture programs dropped in 1999 (*Science and Culture Canada* and *National Science and Technology Week*). It is difficult to measure the impact of the federal decision on Québec organizations. More recently, NSERC set up a program to stimulate youth interest in science and engineering, *PromoScience*, whose budget went from \$1.5 million in 2001–2002 to \$2 million in 2002–2003. The annual budget projected for Canada as a whole through the end of fiscal 2004–2005 is \$2.5 million. During the first three years of the program, Québec projects were awarded about 20% of the available funding, for a total of slightly over \$1 million.

Given Canadian government responsibility for promoting scientific and technological awareness, CST believes that Canada should play a bigger role in supporting Québec activities in the field of scientific and technological culture. CST therefore recommends that

**MDER negotiate a core program funding agreement with the Canadian government in the area of scientific and technological culture, with an obligation for matching funding**

Under this agreement, MDER would collect from a designated federal agency an annual contribution equivalent to half the core program funding budget, or \$3 million within five years. Developed in cooperation with federal authorities on the basis of priorities identified in the government action strategy on scientific culture, this type of joint funding mechanism has several advantages.

This approach would split responsibility for priority program funding between the two levels of government, with Québec's \$3 million share coming from current special project budgets (*Étalez votre science* and *Aide à la relève en science et technologie*). This funding along with the Canadian government's contribution, should cover a good portion of program expenses, leaving organizations responsible for making up shortfalls through contributions from interested partners. Freed from time-consuming fundraising obligations, they will be able to focus on the core missions that are their true *raison d'être*.

The choice of a matching funding mechanism—memorandum of understanding, agency, or independent fund—remains to be determined and should first be examined by a study committee.

### **8.3 Supporting access for all**

Three promising courses of action for democratizing scientific and technological culture should be targeted for special attention. Media production, promotion of science and technology resources at public libraries, and increased use of science and technology materials in schools are three ways to make scientific and technological information available to all groups in society.

New investments are needed in these three areas in the form of special project funding, a suitable formula in this case. Funding mechanisms should be developed in conjunction with the departments concerned: MCC for media production and libraries, and MEQ for scientific and technological culture in schools. The budget for each area should be at least \$1 million. CST recommends that

**MDER associate with other Québec government departments and agencies to provide additional funding of at least \$3 million within five years for media production, promotion of science and technology resources at public libraries, and increased use of science and technology materials in schools**

CST believes that Québec faces significant challenges in becoming a true knowledge-based society and that scientific and technological culture holds one of the keys to success in this regard. Suitable public support is therefore crucial, but MDER financial assistance must not take the place of other sources of funding, including research organizations, other Québec government departments, municipal authorities, and the federal government. MDER must take steps to secure a more generous contribution on their part.

<b>Measures</b>	<b>Budget, \$ Millions</b>	<b>Source</b>	<b>Period</b>
Support for key organizations	3.5	MDER	Short term
Support for core programs	6.0	MDER and federal government	5 years
New accessibility programs	3.0	MDER, MEQ, MCC and other partners	5 years
<b>Total</b>	<b>12.5</b>		