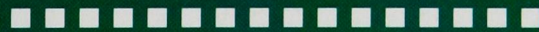




ENVIRONMENT CANADA

SCIENCE AND TECHNOLOGY

MANAGEMENT REVIEW PANEL REPORT



Panel Members:

Moura Quayle (Chair)
Joe Friday
Chaviva Hosek
Camille Limoges
Len Ritter

November, 2004

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Environment Canada

SCIENCE AND TECHNOLOGY

MANAGEMENT REVIEW PANEL REPORT

1. INTRODUCTION ■ ■ ■

The Science and Technology Management Review Panel was created to review, and make recommendations to the Deputy Minister on management policies and practices, as well as a framework for accountability, that should be considered to improve science and technology (S&T) efficiency, alignment, integration and synergy. The Review Panel met on July 7-9, 2004 hearing presentations from Environment Canada staff and engaging in a dialogue to question, learn, synthesize and finally document recommendations. Throughout July and August the panel worked collaboratively to generate ideas, using email and conference calls to write and communicate together.

The panel was charged to comment on the following specific areas that are of importance to Environment Canada:

1. **Management Structure, Systems and Policies:** What kinds of management structures, systems and policies does Environment Canada need to ensure its S&T is effectively integrated and appropriately addressing departmental and government policy and program priorities?
2. **Science-Policy Interface:** What kinds of practices does Environment Canada need to have in place to ensure its science, operational and policy

communities are working together toward a common purpose? Do these practices also ensure that the Department's S&T is relevant to the needs of Canadians?

3. **Cross-cutting Systems, Tools and Policies:** What kinds of tools does Environment Canada need to support its S&T activities, particularly on cross-cutting issues? (E.g., accountability and financial systems, performance measures, capital assets [facilities and equipment], information management, communication activities, incentives, reward structure, collaboration systems, intellectual property policies and training.)
4. **Synergistic Mechanisms:** What kinds of mechanisms does Environment Canada need in order to address the synergistic nature of its work, ensuring interactions across disciplines, services and regions are supported?
 - Does the EC structure support the establishment of effective S&T teams nationally and internationally?
 - Does the structure facilitate opportunities to collaborate and partner with other S&T organizations?
5. **Excellence and Quality Control:** How should Environment Canada ensure the excellence of its S&T? Does the Department's *Framework for External Review of Research and Development*

provide sufficient direction for peer review of R&D programs and activities?

6. **Research Balance:** What balance of basic versus mandate-driven research does Environment Canada need to actively participate in domestic and international research networks critical to its mandate? Is that balance appropriate to enable EC to integrate and coordinate environmental research from all sectors to achieve key environmental objectives for Canada?

Although these questions evaluate the present operations of the Department, the Panel was also asked to consider how the Department's S&T should meet the challenges and opportunities of the future. The panel was to address any related issues or questions raised in the course of the review and deemed of sufficient importance to be called to the attention of the Deputy Minister.

As a result of these priorities, the panel prepared a report that is structured around the following four themes:

1. A Clarified Governance for Environment Canada
2. Scientific Quality and Excellence
3. Relationships: Partnerships, Collaborations and Other Interactions
4. Responsiveness to Emerging Issues

2. SUMMARY OF RECOMMENDATIONS ■■■

THEME I: A CLARIFIED GOVERNANCE FOR ENVIRONMENT CANADA

- 1: Clarify governance and decision-making.

2: Provide the DM Executive Council a strong role in decision making and support the DM by building a Secretariat.

3: Create a research plan and develop tools to facilitate bridging between science & operations and science & policy.

THEME II: SCIENTIFIC QUALITY AND EXCELLENCE

Human Resources for a Scientific Organization:

4: Review and revitalize the hiring process.

5: Create a consortium of universities offering graduate programs in Environmental Sciences & Atmospheric Sciences.

6: Attract students to co-op, internship and other work experience opportunities in EC.

7: Ensure effective mechanisms to recognize, reward and thereby retain quality people.

8: Create an effective process for succession planning.

Strategic Planning For Future of Science & Technology:

9: Initiate an effective long-range planning process.

10: Explore the use of expert panels in key science areas to provide peer review of major science activities and to help set long-term research agendas.

Science Information Systems:

11: Establish an effective, department-wide capability for data stewardship.

12: Provide easy access to EC's data for business, industry and academic communities and the general public.

The Science → Policy → Delivery Continuum:

13: Encourage scientists to move into the policy and delivery arena.

THEME III: RELATIONSHIPS: PARTNERSHIPS, COLLABORATIONS AND OTHER INTERACTIONS

14: Review intra-governmental relationships

15: Clarify and expand university relationships.

16: Expand industry relationships.

17: Capitalize on international relationships.

18: Continue to engage Canadian citizens in appreciating and understanding their environment.

THEME IV: RESPONSIVENESS TO EMERGING ISSUES

19: Initiate a research pilot project on a well-understood and well-developed environmental and human health issue (e.g. pesticides).

20: Find strategic ways to engage the federal "City Agenda".

21: Keep a watching brief on emerging issues and the associated rapidly evolving science.

3. THEMES ■ ■ ■

THEME I: A CLARIFIED GOVERNANCE FOR ENVIRONMENT CANADA

Background

There was considerable comment about the need for integrating Science and Technology across Environment Canada, including operations and services as well as policy-making responsibilities. It was observed, however, that the good intentions of integration have not yet been realized. Worse, the system created to enable integration has now become a significant barrier. Almost every senior executive discussed the high transaction costs of doing business. Some even said they had to ignore the system and its endless meetings in order to get their work done. Most emphasized that the present integration processes were not conducive to timely decision-making. Senior Environment Canada executives seem to have the least time to think strategically because they are the most burdened by the matrix structure.

Processes are meant to facilitate the end goal, but in this case, the process has become so cumbersome that it rarely leads to a decision. Instead, it often leads to more process. It is like Mr. Smith in the Matrix who just keeps coming back again.

On paper, the current system is logical and results-oriented, paying due attention to accountability. However, in practice, the costs of making it work are too high.

This seems to be a case of too much “defensive accountability”, at the price of efficiency in mobilizing scientific knowledge for the benefit of policy, regulation and services.

Although it is beyond the panel’s mandate to re-cast the Department’s entire governance structure, the following elements are recommended for consideration:

- For leadership to be exercised, scientific activities in the Department must be clearly driven by its mission and objectives;
- Emphasis must be placed on quality and relevance of scientific results and services, not on processes;
- Decision-making relative to the conduct and mobilization of scientific activities must be timely;
- Scientific activities must be closely monitored and their results and impacts must be objectively assessed; and,
- Feedback from clients and the fields (regions) where applications occur must be requested and analyzed to improve relevance and quality.

Governance and Decision-making

▪ Recommendation 1 ▪

Clarify governance and decision-making.

Governance and decision-making could be clarified by eliminating the required table meetings and instead creating topical, flexible working groups of limited and variable duration. Substitute fluidity for process conformity. Do not rush quickly to put another system in place. Rather, provide the new Deputy Minister (DM) the flexibility to move across existing hierarchical systems in order to facilitate innovation.

The philosophy behind the results and accountability framework makes sense. The strategic outcomes can be used as themes for consultations with constituent bodies and for planning. This does not mean that this is the way to organize the Department. It is not necessary to use the framework for meetings and for decision making.

Ways of clarifying and integrating for consideration:

- Re-consider current business lines as tools (though burdensome) for monitoring activities in the Department; they have not proven to be effective for timely decision-making;
- Ensure that integration (and decision-making) occurs at the whole Department level; e.g. DM Executive council;
- Use performance mandates from DM for all senior staff as integrative and accountability tools; accountability is a personal matter, not a consensual issue; and,
- Minimize the number of direct reports to the DM (14 is too many). Regional directors could report to an associate DM. Consideration should also be given to appointing an assistant DM acting as S&T Chief Operating Officer in EC (see below).

▪ Recommendation 2 ▪

Give the DM Executive Council a strong role in decision making and support the DM by building a Secretariat.

Since clarification and integration happens at the Deputy Minister level, they should have the most current and relevant information in order to make decisions, set agendas etc. Information should move from

business lines to the whole-Department level (DM Executive Council).

The DM Executive Council should be composed of Executives reporting directly to the DM, plus any other person that the DM deems relevant for the issues discussed at any given meeting.

Such an Executive Council needs the support of a Secretariat. That Secretariat might be composed of persons having an in-depth knowledge of the science and culture of their department sector (e.g. MSC, Environmental Conservation and Environmental Protection). These Secretariat staff members would not be selected to represent or promote the interests of their sector, but the DM would rather ensure that their expertise is mobilized for the service and good of the whole Department.

Advisory Functions to the Deputy Minister

i. Secretariat

The Panel sees the Secretariat as similar to the Privy Council at the level of a complex ministry such as Environment Canada. The Secretariat would have an agenda setting function for meetings of the DM Executive Council.

Two to three officers could be charged with knowing the brief of each component and they would have the power to call the meetings required to solve a problem. Current regular meetings should be assessed as to which ones are needed as opposed to which ones are “ritual”. In particular, the Secretariat would define the objectives of any given meeting (e.g. sharing information, making decisions, brainstorming etc.) and ensure clear outcomes. There should also be key decision-making meetings scheduled by the DM and Secretariat as required (e.g. at least once per year).

The skill set required for these officers is similar to those working in the Privy Council Office (PCO). They have free-ranging access across the Department, asking for information from any department and receiving it quickly and efficiently. The Secretariat members need to be given “status” or authority from the Deputy Minister to carry out these functions.

Such a Secretariat would have a critical function in preparing the transition (6 to 8 months) toward a more functional departmental governance system that centres around leadership from the Deputy Minister. The Secretariat would serve to navigate and integrate between the political goals and science.

ii. Science and Technology Advisory Board

The Panel’s view is that an external Science & Technology Advisory Board (STAB) should be retained. It should be used in support of the Secretariat, though formally reporting to the DM.

iii. Assistant Deputy Minister (ADM)

Science and Technology or Chief Scientist

The Panel is of the opinion that the creation of a position for an EC Chief Scientist is not the best option. Past experience has shown that such a staff function, deprived from the means available to those in line responsibilities, does not confer the authority required for effectiveness. Moreover, the notion that a Chief Scientist ought to exercise broad horizontal overview, despite the fact that they are trained as a specialized scientist - as all scientists are - may generally be resented by scientific peers that understandably question the general wisdom of assuming such a universal expertise.

As a result, the panel recommends that this wisdom would be better exercised and more

easily accepted if it were to reside in the more collective S&T Secretariat (and its external advisers). Such a Secretariat might be put under the authority of an Assistant Deputy Minister, possibly the same acting as S&T Chief Operating Officer (S&T COO). It is that ADM who would be responsible for coordinating department interactions with the government's Chief Scientist.

Regarding the creation of a new ADM position as departmental S&T COO, the Panel advises that simply adding this function to those already existing would not alleviate the problems. Such a new function must overlap with existing responsibilities of other ADMs and with those of the business lines and tables.

The Panel sees the creation of the new ADM function (with the Secretariat as their staff and eventually exercising a key resources allocation role) as a first step in the process of clarifying and simplifying governance structures and processes. In fact, that person would be a close advisor to and collaborator with the DM in implementing the structure and governance changes needed.

Bridging Science and Policy

The research function to support the Department's policies and regulations is critical. Science must be closely aligned to the decision-making and management level.

Currently, the connection between science and policy seems uneven, depending on subject areas, and tenuous at higher levels.

The linkage seems to work better at the regulatory and operational levels than at the level of strategic policy (e.g. MET Services Canada research in support of weather prediction seems to be working well).

The panel was informed by some that research is 100% focused on the policy development needs of the Department, it remains unclear as to how research priorities are actually set, how research projects are picked and how they are terminated. The Panel was unable to obtain clear answers in this regard and this lack of clarity was expressed by many of the executives interviewed.

On the whole, it was not possible to ascertain whether the science feeds policy processes effectively and whether a framework exists for assessing the relevance and degree of urgency of different research programs and data gathering options.

Moreover, the need for ensuring a flow of information, properly organized and channeled, between science and policy ought to be given high priority. This requires concerted efforts at translation of science for the benefit of users (decision makers and clients of the Department).

▪ Recommendation 3 ▪

Create a research plan and develop tools to facilitate bridging between science & operations and science & policy.

The Panel suggests the creation of a research plan based on the high-level policy framework of the Department, with clear criteria for exit as well as entry into projects. Similarly a review process for current collaborative research MOUs is required so that they are all aligned with the Department's overall strategy.

The development of a departmental Environment-Economy Framework is currently under discussion. That framework would have three components: 1) Competitiveness, 2) Individual health, and 3) Planetary Health.

The Panel fully supports such an endeavor as it would greatly assist in making principled decisions with explicit and thoughtful consideration of the required trade-offs. It would also facilitate the setting of priorities. Finally, it would enable EC to interact more effectively with other departments with an economic mandate, helping those departments see EC policies as more relevant to them.

Learning from applications is vital. The Panel observed that, in some cases, the lessons learned after implementation of programs were not being fed back into the decision-making structure. To be truly effective, this feedback is essential for improving the policy decisions and programs. A program in place should not be assumed to be working.

A special mention of the research within MSC might be illustrative of the potential for synergy among the various portions of Environment Canada. The research within the MSC is aimed at its mission, but the programs within MSC impact many policy areas across EC and beyond. The observation networks, essential for MSC operations, provide data for climate and air quality studies. The radar network essential for weather forecasting provide useful data for water quality and quantity studies, etc. Therefore, research efforts on weather could have major implications for other parts of EC if the planning and organization of the efforts considers department-wide needs during the formulation phase of the research programs.

The experience of regional implementation is a rich source of feedback information and needs to be more systematically used.

Industry should be a partner, not a target. The historical distrust between government and industry should be overcome and the broadly based international perspective that

industry can bring to bear on public policy in Canada is very important and should, at least, be considered. An Environment-Economy Framework would provide a useful tool for discussion and collaboration with environmental groups, as well as with industry.

Mechanisms for Consideration:

- The Panel noted the success of the Adaptation and Impacts Research Branch of MSC in translating scientific knowledge to policy-relevant information. However, it is essential that weather-related research be integrated into the rest of Environment Canada's research agenda. With this integration added to the successful knowledge translation activities, the Panel recommends this as a best practice for Environment Canada.
- The Air Quality Research Branch requires a two-page summary of all research papers. These summaries translate the research results into plain language and express the policy implications. The Panel has seen examples of these summaries, which are interesting. However, it is recommended that to better ensure their effectiveness, these summaries should be assessed by a panel of potential users and improved accordingly. Such a tool could be useful in translating the science to policy makers department-wide.
- Several senior research managers reported that the preferred target audience for science communications was the top level of management, (e.g. CEOs and senior public servants). Although this may be appropriate in some cases, the Panel urges consideration of effective communications to all levels of society about science, including the general

public and grades K-12. Improving the science literacy in young people will stimulate interest in the science as a career as well as increasing their contribution as citizens. Strengthening this group's understanding of the role of Environment Canada will in the long term help EC fulfill its mission better.

- It seems that there are many collaborative research relationships that were created because there was not enough money inside the Department to adequately fund projects. The Panel was assured by research leaders that they manage their staff to focus on research that informs policy and regulation. Thus they avoid mandate shift and doing research primarily because it can be jointly funded, or because there is a collaborator/client willing to pay for the research. The Panel is not convinced this is the case. In the absence of a clear and well-understood process for creating strategy-driven research, there can be any number of worthy research projects competing for scarce resources.
- Mechanisms need to be developed for starting and stopping science activities in light of changing priorities and emerging issues. Mechanisms for equitable and timely *reallocation* of funds need to be developed.

**THEME II:
SCIENTIFIC QUALITY AND
EXCELLENCE**

Background

Environment Canada is a science-based organization. Quality science is required to bring the best weather, climate, air and water quality and other mission-related

information to Canadian citizens. As a part of its regulatory mission, Environment Canada utilizes, employs and invokes an evidence-based decision-making process. These regulatory decisions and policies may imply constraints and costs for both organizations and citizens. Consequently, they must be made on the best available evidence which comes from high quality science.

High-quality people and processes are requirements for Environment Canada to ensure quality science. Additionally, facilities infrastructure is also required, but the scope of the Panel's work was limited and did not permit an assessment of the adequacy of the scientific facilities used throughout the organization. In interviews with senior managers, certain issues arose to be addressed, including human resources, strategic planning and science information systems:

Human Resources for a Scientific Organization

**▪ Recommendation 4 ▪
*Review and revitalize the hiring process.***

When asked about the hiring process, senior managers reported that the process was more ad hoc than anything else. As a result, the Department should hire in a way that is more congruent with the approach good universities use to hire (e.g. longer interviews, candidate presentations, etc). This would also allow for increased recruitment of women and visible minorities into the Department.

Implementation of this recommendation will enable Environment Canada to ensure a continuing high level of scientific capability of its staff. It would also enable more immediate response to the emerging issues described in Theme IV.

▪ **Recommendation 5** ▪

Create a consortium of universities offering graduate programs in Environmental Sciences & Atmospheric Sciences.

The consortium would permit communications with the Canadian academic community concerning science and technology issues of importance to the Department. Environment Canada could work with them to define the current and future human resources needs of Environment Canada, defining skills and competencies required. Environment Canada needs learning outcomes that include competencies in communicating science and risk communication to various audiences. Skills and competencies associated with both science and management (e.g. business, people management, leadership) are a necessity in the government workplace.

▪ **Recommendation 6** ▪

Attract students to co-op, internship and other work experience opportunities in Environment Canada.

The future of Environment Canada depends on its ability to attract the best people with new cross-skill capacities like science-communication and science-management. The Department might develop scholarship programs to attract interested students and enlarge the cohort from which it can hire its staff over the next years of high demand.

▪ **Recommendation 7** ▪

Ensure effective mechanisms to recognize, reward and thereby retain quality people.

There seems to be little problem in retaining staff at Environment Canada based on

discussions with senior managers. Indeed, the length of time people stay in the same organization requires conscious efforts to prevent staleness of ideas and approaches. This calls for increasing the opportunity for exposure of researchers to new ideas and new people. Therefore, opportunities for professional continuing education, international connections and other developmental activities are critically important. One suggestion might be to hold an internal, biannual conference that would encourage intellectual exchange about science and continuing education opportunities. The Department should explore methods of publicly recognizing great scientists or scientific teams within Environment Canada.

▪ **Recommendation 8** ▪

Create an effective method for succession planning.

While some senior managers are doing succession planning, the Panel is not confident that it is being done throughout the Department in any systematic way. There seem to be very few people applying for senior science leadership positions and this presents a challenge because of the retirement potential of senior leadership. Succession planning should include opportunities for potential future managers and leaders to expand their experiences to include the issues addressed at the higher levels of the organization – positions they may occupy in the future. It may also be valuable to consider limiting the tenure of senior level positions – DGs and ADMs - in such a manner that would recognize the need for continuity, while accepting the value of new leadership. This type of model is widely accepted in many other sectors (academic) and seems to have withstood the test of time.

Strategic Planning For Future of Science & Technology

▪ Recommendation 9 ▪
Initiate an effective long-range planning process.

Planning 10-20 years ahead is necessary for a science-based organization to ensure cutting edge science is available to the decision makers and operators. But, when the Panel asked senior managers about long-range planning (>5 years) there were very few answers received. A concerted effort is necessary to evaluate the future directions and emerging issues in environmental and atmospheric sciences. This requires a view external to the organization.

▪ Recommendation 10 ▪
Explore the use of expert panels in key science areas to provide peer review of major science activities and to help set long-term research agendas.

Peer review by leading experts will help ensure the quality of the science programs of Environment Canada. The Panel recommends that new programs should be peer reviewed by a panel of world class scientists to ensure the direction is reasonable and the results be subject to peer review before implemented in policy decisions. (MSC has used such an international peer review team to examine its research agenda for the past four years.) The Royal Society could be used to review the overall research agenda of the Department.

Environmental sciences cross several disciplines and departments of the federal government and these partners must be part of the long-term planning process. Some panels should be commissioned jointly between departments, e.g. the health of Canadians [EC,

AAFC, Health, DFO, CFIA and CIHR]. Long-term planning processes need to recognize and stay alert to other organizational elements outside of EC and the potential contribution of these organizations to achieving EC objectives. For example, the potential loss of oceanographic research institute in Bedford (DFO) will negatively impact MSC's capacity to forecast weather because of a loss of oceanographic model development. The NPRI (National Pollutant Release Inventory) is a good example of cooperation between regulator and the regulated. Industry is required to report annually on releases to the environment which (1) helps develop the compliance programs; and (2) serves as an important tool for monitoring the effectiveness of public policy.

Science Information Systems

▪ Recommendation 11 ▪
Establish an effective, department-wide capability for data stewardship.

Environment Canada has the responsibility for the data stewardship related to its mission. This requires a commitment to long-term data archive including information on toxics, tissue samples, atmospheric samples, climate records etc. This activity should be done with the fervour of a priesthood. The archival materials should include not only the data, but the associated meta-data. Attention should be paid to capturing data sets when scientists leave Environment Canada.

▪ Recommendation 12 ▪
Provide means of easy access to Environment Canada's data for business, industry, and academic communities and the general public.

The reason for capturing data is to foster the most efficient use of public resources.

These data are useful for business, industry, the academic community, different levels of government and the public at large. Where possible, efforts should be made to ensure Environment Canada's data should be publicly accessible.

The Science → Policy → Delivery Continuum

▪ Recommendation 13 ▪
Encourage scientists to move into the policy and delivery arena.

Although some well-qualified scientists may not have traits suitable for quality policy or operational experts, the Department should work on the developmental challenge for scientists to move to policy and delivery. When the necessary skills can be developed or discovered, the potential for effective policy or operational delivery can be enhanced by having this linkage. The Department needs to reward scientists who can do this. Scientists who practice "extension" or "knowledge transfer" or "community connections" are needed in Environment Canada. Part of this might be the "teaching" aspect of their jobs, especially if connected to universities.

THEME III:
**RELATIONSHIPS: PARTNERSHIPS,
COLLABORATIONS AND OTHER
INTERACTIONS**

Background

There are several reasons that EC requires a strategic approach to partnerships and collaborations. The mandate of EC intersects with that of many other departments of the Government of Canada. Its work may lie at the intersection of more departments than

almost any other, yet it is not and will not be a central agency.

As a department whose work is heavily science-based, it is faced with the difficulties and opportunities of the horizontal management of science more than almost any other department in the federal government. Jurisdiction on environmental matters is shared between federal and provincial governments, while municipal and local authorities have significant roles to play in environmental protection and remediation. Science in the service of all these jurisdictions should be designed with jurisdictions and differential capacities in mind.

In addition, the changes and cuts that came out of the Program Review have impinged on the science capacity of the Department. The federal government's investments in university-based science and technology have changed the balance of resources for environmental research in Canada. Some of the Department's responses to these challenges are appropriate, but others seem to be overly complex and very difficult to manage. In addition, working in partnerships and collaborations is itself a complex management and governance task. (*The Governance of Horizontal Science and Technology: Issues and Options* written by Jim Mitchell, June 2003)

▪ Recommendation 14 ▪
Review intra-governmental relationships.

Conduct a survey of key collaborating departments to assess their perceptions of the effectiveness of the scientific relationships they have with Environment Canada, using the information to improve.

The Panel was told that there is successful scientific collaboration between EC and

other departments of the Government of Canada. However, the Panel did not meet anyone representing any of those departments, and therefore, has no way of knowing, from the point of view of those departments, what is working well and what could use improvement. This recommendation is meant to open the door to a discussion within EC of the adequacy of the collaborations they currently have with other departments on the basis of some feedback from those departments.

University Relationships

In the past, government researchers were more numerous, better trained and better resourced than researchers at Canadian universities. More recently, university research has improved in quality and in the resources available, and Canadian university research in several key fields is at a world quality level.

Program review, with its cuts to the science capacity of the federal government, was followed by increased direct support to university research. This was a conscious decision by government to support the evolving knowledge society and to create a better capacity to train highly qualified personnel. Government scientists have felt that these decisions have marginalized them and that their work and standards of scientific quality were not respected. Public policy has shifted and EC scientists must move with the new reality to take full advantage of the increase in academic funding, as well as the growth in the quality of academic research. In this new context, leadership is required to bring research scientists in EC back to a position of legitimacy, including both respect from peers and self-respect, for their contributions to science and to government-university collaborations.

There are a number of possible mechanisms for collaboration with universities. While the Panel recognizes that EC has piloted many of them, EC needs to make sure that it has gone beyond the written contract to the spirit of collaboration.

Mechanisms for consideration

The Panel suggests that university-government collaboration could be increased through:

- cross-appointments;
- co-location of research institutes;
- movement of graduate students from government labs to universities and back; and,
- development of science curricula that recognize capacities that EC and other departments need now and will need in the future.

▪ Recommendation 15 ▪ *Clarify and expand university relationships.*

The Panel suggests that EC analyze successful and failed versions of each of the mechanisms noted above to derive criteria for best practice. It also makes sense to publicize successes in government/university collaborations (e.g. a prize for best examples of collaboration).

Do not collaborate pro-forma. Articulate clear goals for each collaboration, together with clearly articulated minimum expectations from each party, (e.g. number of jointly trained students, number of co-sponsored events, co-publications). Do not allow co-location to be merely a mechanism for getting a new building on campus, but go back to existing co-locations and put life into the ones that already exist.

Industry Relationships

After two days of briefings the Panel realized that no one had mentioned the potential value of relationships with industry. EC should recognize that some of the firms in the industries they regulate have tremendous and growing scientific and technical capacity. Closer collaboration with the scientific base in industry will pay off in the long run. This probably will require a change in the culture at EC.

▪ Recommendation 16 ▪ *Expand industry relationships.*

Identify the companies with strong science capacity and build systematic relationships with their scientific and technical leaders. Engage with industry scientists to identify emerging research issues and opportunities. Sponsor events at which pre-competitive research can be shared between industry and EC. Place students inside strong science companies for part of their preparation for working at EC.

International Relationships

The most senior scientists at EC have international reputations and individual connections to the global research scene in their own discipline or sub-discipline. In addition, some of the research units are part of international consortia (e.g. the meteorological service or climate change research). However, the Panel did not find that there is a systematic or strategic effort to link the EC researchers to their international peers. Peer review, of course, is international, but that is not the same as live and consistent engagement with the best researchers in the world in any field.

▪ Recommendation 17 ▪ *Capitalize on international relationships.*

The Panel suggests that a coherent and strategic international strategy could benefit Environment Canada. The scientists interviewed reported that the budgets for travel to conferences were very limited. Attending large conferences may not be the best way to build and sustain science capacity. It may offer a way of scanning the research environment for what's new, but little opportunity for depth of relationships. There is often little follow-up from such conferences. There should be adequate resources for scanning the research environment in EC as part of ensuring high-quality science.

A better use of resources might be to identify countries with similar environmental challenges to those of Canada and which have high quality research, and then build stronger and deeper collaborations with them (e.g. Sweden and Norway). In addition, there will always need to be research links between EC and US and Mexico scientists because of shared geography.

Citizen relationships

As the Panel met with senior colleagues within Environment Canada, it seemed that when projects were about real ecosystems or landscapes in a region, there was an exciting integration that occurred among science, policy and the citizenry. There is an important role that Environment Canada plays in citizen involvement and education through science and technology. As a result, this role may be better enhanced by looking at how much impact environmental literacy of the populace has on policy and behaviour change. The more citizens know about

climate change and the need to change behaviour to be part of the solution, the more effective science and resulting policy can be.

The Panel also discussed who the most important players in affecting policy were, e.g. who should be the target audience? Some EC members argued that the decision-makers were where they should be spending their time. The Panel wondered, however, if youth weren't even more important.

▪ Recommendation 18 ▪
Continue to engage Canadian citizens, especially youth, in appreciating and understanding their environment.

Using many of the mechanisms already in place, continue to provide (1) a variety of "windows on science" for the general public to enhance their environmental literacy; and (2) possibilities for engagement and ecosystem-based projects that involve EC scientists.

As discussed in the background to this theme, EC is already engaging the public in a variety of ways. This recommendation, however, urges an even deeper connection between EC science and the public. Can science be placed as much as possible into the context of the real ecosystem? Could more of the science and policy connections be organized around the landscape or landscape units in question? (e.g. the Panel found the "regional science stories" compelling, in terms of the work being done on the St. Lawrence, in the Georgia Basin and in the north).

THEME IV: RESPONSIVENESS TO EMERGING ISSUES

Background

Environment Canada must be aware of emerging issues and anticipate the science needs to support them. Emerging issues could be well addressed by topical working groups with varying composition and duration. The process to identify future priorities must be sufficiently disciplined to maintain rigor and be scientifically robust while maintaining sufficient flexibility to recognize and adapt to rapidly emerging and evolving issues. Many of these issues will not originate in Canada, but Canada will be required to respond within the global context.

Environmental and human health, and the urban environment are examples of areas for Environment Canada to address in the future.

Environment and human health

The interface between environment and human health in Canada is typically addressed by different departments without serious collaboration and budget-sharing. Although discussions with various department officials indicated collaboration with other government departments, including Health Canada, the impression is that it continues to be a responsibility that is trying to be held by two departments.

In some respects, it appears to be a competition for priorities, rather than an ongoing collaboration. We do understand

that strides have been made for harmonized approaches (joint jurisdiction of CEPA), however, it is ad hoc and the need to recognize the interdisciplinary relationship between environment and health does not appear to be embedded in either culture – environment or health. The importance for collaboration between, for example, environment and health, is evident in recent “made in Canada” tragedies such as the deaths in Walkerton, Ontario which many authorities argued resulted from a failure by various government departments to collaborate on issues related to land use.

The importance of inter-departmental collaboration was recognized by the Canadian Institutes of Health Research two years ago when it engaged both Environment Canada and Health Canada in a proposed new initiative that was proposed to address important scientific issues at the interface. Our understanding is that the promised support from both departments that was required to launch this initiative did not materialize and the program did not get underway.

The US National Institutes of Health created the National Institutes of Environmental Health Sciences almost 30 years ago. Canada still has to come to terms with the importance of the interrelationship of environment and human health outcomes.

▪ **Recommendation 19** ▪

Initiate a research pilot project on a well-understood and well-developed example of an environmental and human health issue (e.g. pesticides).

The topic of pesticides may be a good starting point because it's a relatively well-developed scientific base within individual

disciplines. But despite having a very public profile it is not well developed where disciplinary areas overlap (e.g., agriculture, environment and health). While recent new funding for environmental research on pesticides has become available to EC as a result of the PMRA, this new initiative still appears to be devoid of a policy driven component or the need to better integrate the environment/health interface; the policy – science relationship continues to be weak and needs to be strengthened.

Cities and Communities: the built environment

The Government of Canada is engaged in determining its appropriate role in relation to urban Canada. The mandate of the Cities Secretariat at Privy Council Office includes collaboration with other departments. The City Secretariat already has a good working relationship with Environment Canada. The Secretariat has recently merged with Infrastructure Canada and the links between Infrastructure and Environment will most likely be quite extensive given that Infrastructure previously reported through Environment Canada.

▪ **Recommendation 20** ▪

Find strategic ways to engage the federal “City Agenda”.

Environment Canada has the potential to collaborate in facilitating a single federal lens on Canada's cities and communities.

While working relationships between the Cities Secretariat and Environment are good, the Panel recommends that Environment Canada work with the Cities Secretariat to facilitate a single federal lens on Canada's cities and communities. More regularized

ongoing contact at the Deputy- or ADM-level (e.g. Samy Watson to André Juneau, Noreen Smith to Yazmine Laroche) is important.

For example, the Cities Secretariat is currently working on a Policy Framework for Cities and Communities and input from Environment Canada would be extremely valuable. As well, ongoing meetings at the senior level may offer opportunities to pursue areas such as brown field redevelopment, which the Prime Minister has identified as part of the Cities agenda.

In addition, Environment Canada is doing work on environmental indicators and the Cities Secretariat is very interested in indicators of environmental sustainability in cities. The two Departments could work together to ensure that that sustainability is a platform for all Infrastructure Canada decisions.

▪ Recommendation 21 ▪

Keep a watching brief on emerging issues and the associated rapidly evolving science.

There are important emerging issues of international importance that Environment Canada should be tracking. One example is the development and propagation of genetically modified organisms and the potential for inadvertent environmental release.

It is accepted that genomics will play a key role in basic research as well as in policy development. This underscores the importance of recognizing the highly specialized nature of this and other rapidly emerging societal issues, and the need to ensure that the required special intellectual skills are highlighted in a long-range HR plan. This will guarantee that EC has the science capacity to meet the challenges of the future.

4. PANEL MEMBERSHIP

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