Implementing the Principles and Guidelines of the Framework for Science and Technology Advice: A Guide for Science and Policy Managers

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A Guide for Science and Policy Managers

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Comments

This guide will be periodically updated, based on feedback received from departments and agencies. Comments, suggestions or questions should be forwarded to:

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A Guide for Science and Policy Managers

1.0 INTRODUCTION

The Framework for Science and Technology Advice[1] is the federal government's response to the Council of Science and Technology Advisors' *Science Advice for Government Effectiveness* (SAGE) report.[2] The Framework lists a set of six principles, 26 guidelines and three broad implementation measures that promote the effective use of science and technology advice in government decision making.

The Framework has been adopted as government policy, and the government has committed all departments and agencies to implementing it by March 2003.

The principles and guidelines in the Framework build upon current practices and mechanisms already employed by departments and agencies and establish a benchmark against which to test the robustness of science and technology advisory processes (science assessments, expert advisory committees, regulatory advisory processes, etc.).

The guide provides science and policy managers in federal science-based departments and agencies with a practical tool (a self-assessment worksheet) that they can use to assess their adherence to the principles and guidelines in the Framework.

This guide can also serve as a reference tool, as it briefly describes other initiatives that have been undertaken interdepartmentally to aid managers in meeting the overall objective of the Framework. (Consult Appendix 1 if you have general questions on the Framework.)

Many science-based departments and agencies have already initiated activities to help them adhere to the Framework. This guide is not meant to supersede or supplant these activities. Its inherent philosophy is to respect the individual circumstances and differences that characterize each department and agency, meanwhile providing some common approaches and tools they can use, regardless of their particular field of science or technology.

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[1] *A Framework for Science and Technology Advice: Principles and Guidelines for the Effective Use of Science and Technology Advice in Government Decision Making.* Industry Canada. Ottawa. 2000. http://strategis.ic.gc.ca/pics/te/stadvice_e.pdf

[2] *Science Advice for Government Effectiveness* (SAGE). Council of Science and Technology Advisors. Ottawa. 1999. http://csta-cest.gc.ca/pdf/sage_e.pdf

2.0 SELF-ASSESSMENT WORKSHEET

Applying the Framework for Science and Technology Advice is analogous to an S&T organization reviewing its operations against an identified standard, such as an ISO standard. In the same way that a laboratory will periodically conduct an internal audit of its scientific procedures against accepted technical standards, science and policy organizations within a department or agency would assess their science advice procedures against the principles and guidelines in the Framework.

The worksheet in this section is intended to help science and policy managers self-assess their practices. However, it is not the intention of this guide to restrict the use of the worksheet to self-assessments only; indeed, organizations may choose to have all or part of their science advisory procedures evaluated by a third party (i.e., review and audit groups or external assessors). This is left entirely to the discretion of each department or agency.

In the normal course of events, once a process has been assessed there is no need for ongoing reassessment unless circumstances change appreciably.[3] New processes that are introduced should be reviewed for adherence to the Framework's principles and guidelines.

2.1 Scope of the Self-Assessment

An initial question that assessors in each department will want to consider is "What is the scope of the assessment: to focus on key science advisory processes (e.g., regulatory assessment procedures) or key issues (e.g., climate change, water) or key initiative (e.g., ecosystem initiatives)?" Answering this question may be the hardest part of applying the Framework. Here is how the Framework describes the scope of science advice:

> *This Framework will [apply to] policy, regulatory and management decisions [that] are informed by sound science and technology (S&T) advice. (Science should be construed broadly to include the sciences, engineering and technology.)*[4]

The Framework goes on to discuss sound science advice:

> *... as a key input to policy formulation both nationally and internationally ... these principles and guidelines address science advice as one input in government decision making. Clearly, decision making in government must consider a wide range of other inputs ... and consult, as appropriate, advisors competent in many aspects of public policy ...*
> *...The principles and guidelines contained in this report address how science advice should be sought and applied to enhance the ability of government decision makers to make informed decisions ...* (emphasis added)

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[3] That said, in the spirit of the Framework principle of review, there may be value in a periodic reassessment of the activities that fall under the scope of the Framework.

[4] *A Framework for S&T Advice*, Introduction.

In general terms, you may envisage two kinds of science advisory processes – formal and informal. A formal process might include, for example, the operation of a standing advisory committee that deals with ongoing policy issues (e.g., disease surveillance, drug approval, species-at-risk designation). An informal process might include scientific and technical networks or procedures that departments use to respond to unforeseen or ad hoc policy issues.

It can be difficult to test informal processes and activities for adherence to the Framework's principles and guidelines. If you find it hard to apply the Framework to an informal process, you may want to consider formalizing the process. For example, if your department provides feedback to scientists through an oral briefing you may wish to institute a more formal feedback process, such as a "record of decision" memorandum to staff.

When completing the worksheet, departments and agencies should keep in mind that the Framework is meant to apply both to science and to science advice; that is, to the department's research and development and related scientific activities, as well as to the processes by which science is translated into policy. However, the worksheet does not explicitly assess the conduct and management of federal science and technology. The Council of Science and Technology Advisors' *Science and Technology Excellence in the Public Service* (STEPS) report[5] identifies the characteristics of excellence in federally conducted and managed science and technology and identifies techniques for assessing S&T excellence.

Even though the focus of the self-assessment worksheet is on mechanisms and how better to align them to the principles and guidelines in the Framework, it is important to note that the success of any mechanism is dependent on the individuals who are providing the expertise, giving the advice, developing the options and making the decisions. Therefore, a key objective of this guide is to raise awareness of the Framework requirements so that managers can ensure that their staff have the types of competencies, training and development, tools and support they will require to fulfill obligations under the Framework.

2.2 What Level of Effort Should We Devote?

A major objective of the self-assessment approach is to empower individual science and policy managers to conduct their own assessment and thereby reduce the time and expense of the Framework review process. A general rule of thumb is that the level of effort devoted to the review should match the size, complexity and importance of the science advisory process and decision. For instance, an individual manager might assess the operations of a program advisory committee in one or two hours, using only his or her own time. Assessing a new regulatory process might require more time and possibly the use of an external advisor.[6]

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[5] *Science and Technology Excellence in the Public Service (STEPS): A Framework for Excellence in Federally Performed Science and Technology.* Council of Science and Technology Advisors. Ottawa. 2001. http://csta-cest.gc.ca/pdf/STEPS.pdf

[6] External advisors could be recruited from another part of the department (e.g., the review and audit branch) or from outside (e.g., an independent consultant).

2.3 A Note on Using the Self-Assessment Worksheet

The self-assessment worksheet includes examples of a variety of "good practices" that are consistent with the principles and guidelines in the Framework for S&T Advice and may be in use by science-based departments and agencies. For example, under the Framework principle of Early Issue Identification, there are a number of different practices, including:

- Foresight studies
- Issue scans
- Technology maps
- Early warning systems
- Science "brainstorming" meetings
- Risk committees
- Expert advisory committee
- Membership in "futures networks"
- Environmental monitoring
- Linkages with international scientific organizations

Similarly, the other principles and their guidelines are accompanied by a variety of indicators of good practice.[7] Appendix 5 contains a glossary of good practices.

You will notice that some principles and guidelines have relatively few good practices listed. This may indicate that departments and agencies are still searching for ways to put the principles and guidelines into action.

The worksheet can be used to assess the degree to which a particular activity adheres to the principles and guidelines of the Framework. The degree to which departmental processes conform to the principles and guidelines can be:

Fully	No change required
Largely	Some improvement required
Somewhat	Improvements required
N.A.	The principle or guideline is not applicable to the particular process

When improvement is called for, assessors are encouraged to propose an improved approach to that process. At this point it might be helpful to refer to the good practices to determine what improvements may be needed.

The worksheet tries to strike a balance between the common aspects of applying the Framework and the individual characteristics of departments and agencies.

[7] A number of "good practices" examples arose from the proceedings of an interdepartmental workshop held in 2001. The list of good practices is not intended to be complete and there are doubtless other practices that could be included.

2.4 Self-Assessment Worksheet

SCOPE OF ASSESSMENT	
Department/Agency	
Branch/Unit	
List of key players (scientists, advisors, policy analysts, etc.)	
Short description of process, issue or initiative being assessed	
Contact person	

FRAMEWORK ELEMENT		DEPARTMENTAL RESPONSE		SELF-ASSESSMENT	
Principle	**Guidelines**	**Suggested Assessment Questions**	**Examples of Good Practices[8]**	**Describe how you are addressing the assessment questions**	**Rate Adherence[9] Fully/Largely/ Somewhat/N.A.**
I-Early Issue Identification *The government needs to anticipate, as early as possible, those issues for which science advice will be required, in order to facilitate timely and informed decision making.*	*I-1 Decision makers should cast a wide net – consulting internal, external and international sources – to assist in the early identification of issues requiring science advice.*	1.0 Are there mechanisms[10] in place or is there access to mechanisms that will assist in early issue identification? Do these allow for: a. input from varied sources (internal, external and international)? b. individual employees (scientists, science advisors or policy analysts) to identify issues to management? c. members of the public or stakeholders to aid in early issue identification?	• Foresight studies (1) • Issue scans • Technology maps (2) • Early warning systems • Science "brainstorming" meetings • Risk committees (3) • Expert advisory committee • Membership in "futures networks" • Environmental monitoring • Linkages with international scientific organizations		
	I-2 Decision makers, policy advisors and scientists should communicate emerging issues requiring advice, and improve the connections between research and potential policy or regulatory issues.	2.0 Are there effective relationships between scientists, advisors, policy analysts and decision makers to ensure identified issues are communicated in a timely manner? 2.1 Are there procedures to assess findings of early issue identification activities?	• Science forum (16) • Science policy teams (4) • Expert advisory committee		

[8] The numbers in parentheses correspond to the item numbers in Appendix 5.
[9] The degree to which departmental processes conform with the principles and guidelines can be: Fully (no change required); Largely (some improvement required); Somewhat (improvements required); or N.A. (not applicable).
[10] The word "mechanism" is interchangeable with procedure, policy, guideline and process.

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Principle	**Guidelines**	**Suggested Assessment Questions**	**Examples of Good Practices[8]**	**Describe how you are addressing the assessment questions**	**Rate Adherence[9] Fully/Largely/ Somewhat/N.A.**
	I-3 Departments should support and encourage their science and policy staffs to establish linkages with each other and with external and international experts.	3.0 Are there procedures through which science and policy personnel can work together to act on the major outcomes of early issue identification? 3.1 Do procedures and mechanisms allow the department and its managers to call on Canadian and international experts as required?	• Science-policy linkages (5) • Inventory of experts (7) • Issue advisors • Expert advisory committee • Participation in international fora		
	I-4 Departments should maximize interdisciplinary and international co-operation, and the use of expertise across government departments and levels of government, to identify, frame and address horizontal issues. *I-5 Departments should maximize the use of new and existing science and expert advisory bodies.*	4.0 Are there mechanisms for engaging other departments and disciplines to help identify emerging issues or to address solutions? 4.1 Are there mechanisms for sharing the results of early issue identification with other government departments with similar mandates?	• Interdisciplinary teams • Interdepartmental committees • Expert advisory committee		
II-Inclusiveness *Advice should be drawn from a variety of scientific sources and from experts in relevant disciplines, in order to capture the full diversity of scientific schools of thought and opinion.*	*II-1 Departments should seek science input and advice from a wide range of sources, and decision makers should consider the multiple viewpoints received.*	5.0 Do research and assessment mechanisms canvass a wide range of multidisciplinary scientific opinion? 5.1 Do science and policy activities consider traditional knowledge?	• Inventory of experts (7) • Citizen science (11) • Aboriginal specialist group • Expert committees		

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	Departments should also consider engaging external, independent agencies to create advisory panels or to solicit advice on complex or controversial issues.	5.2 Are there procedures or policies that allow for the creation of ad hoc advisory panels to address complex or controversial issues?			
	II-2 ... advice from external and international sources ... is sought when: *a. the problem raises scientific questions that exceed the expertise of in-house staff;* *b. the issue is horizontal... ;* *c. there is significant scientific uncertainty;* *d. there is a range of scientific opinion;* *e. there are potentially significant implications for sensitive areas of public policy; or* *f. independent scientific analyses can strengthen public confidence.*	6.0 Have procedures and policies been established to empower and encourage science and policy managers to seek external advice?	• Intergovernmental/ international MOUs • Multidisciplinary teams		
	II-3 Departments should ensure that the selection of advisors: *a. is matched to the nature of the issue and the breadth of judgement required;* *b. is balanced to reflect the*	7.0 Have robust procedures been established for selecting advisors? • Are formal qualification criteria considered in the appointment of advisors? • What measures are in place to ensure selected advisors match the nature and breadth of	• Regional advisory networks • Non-traditional advisory networks • Conflict of Interest and Post-Employment Code for the Public Service (13)		

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	diversity of scientific opinions and to counter potential biases; and c. includes some experts from other, not necessarily scientific, disciplines.	judgement required? • Are conflict of interest guidelines in place for advisors?			
	II-4 Departments should ensure that members of external advisory bodies are regularly rotated, with replacements chosen to preserve balance of representation.	8.0 Are there guidelines or procedures for the rotation of advisory committee members?	• Guidelines for Expert Panels (17)		
	II-5 Decision makers should be open to both solicited and unsolicited advice.	9.0 Are there mechanisms to receive, acknowledge and consider unsolicited advice in research and policy activities?	• Web consultations and communications (9) • S&T briefings for central agencies		
III-Sound Science and Science Advice *The government should employ measures to ensure the quality, integrity and objectivity of the science and science advice it uses, and ensure that science advice is considered in decision making.*	*III-1 Departments should:* *a. ensure that all science and science advice used for decision making is subject to due diligence...;* *b. ensure that in-house expertise exists to assess and communicate science ... to decision makers;* *c. ensure that a strong link exists between science advisors and ... policy advisors;* *d. promote professional practices for those involved*	10.0 Is there a due diligence procedure in place for major science policy activities? • Are there adequate resources and expertise to assess science? • Are there adequate resources and expertise to communicate science? • Does the department apply science advice conflict of interest codes or guidelines to its science advisory procedures? • Are researchers encouraged to publish their work in peer-reviewed publications?	• Science networks (10) • Peer review (21) • Departmental science-policy discussion fora (22) • Multidisciplinary assessment committees • Science-policy staff exchanges • Joint science-policy seminars and workshops • Values and ethics workshops • Promotion criteria for research scientists modified to include science policy contributions • Professional development and training programs on the		

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	in ... science, and provide and enforce conflict of interest guidelines, with these considerations: *i) science advisors should declare any conflicts of interest...;* *ii) decision makers ... responsibility for protecting against actual or perceived conflicts of interests; and* *e. support and encourage government scientists to publish their research findings and conclusions in external, peer-reviewed publications.*	• Are there formal and/or informal communication channels linking researchers, science advisors and policy advisors?	Framework for S&T Advice, science communication and the science-policy interface in government. • Science assessments (8)		
	III-2 Decision makers should: *a. require that science advice be provided to them unfiltered by policy considerations;* *b. be conscious of possible biases among the science advisors and in the science advice received; and* *c. involve science advisors in the identification and assessment of policy options, to help maintain*	11.0 Do existing mechanisms permit science advice to be provided unfiltered to decision makers? 11.1 Do briefing papers explicitly discuss the findings and conclusions of the department's research and assessment activities? 11.2 Are science personnel involved in the development of policy options and outcomes?	• Central agency briefings • Ministerial expert panels • Feedback mechanisms to scientists • "Records of decision"		

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	the integrity of the science advice.	11.3 Do policy analysts provide feedback to researchers?			
	III-3 Scientists and science advisors should: *a. have the flexibility, within the issue being examined, to explore the range of conclusions and interpretations that the scientific findings might suggest;* *b. assist decision makers and science managers to set research priorities and design a research base that will support future science-based decision making; and* *c. recognize the existence of other considerations in decision making.*	12.0 Is there an environment that fosters a culture of openness? 12.1 Does the department consult science advisors on major priorities? 12.2 Are efforts being made to inform scientists of the policy process?	• Whistleblower protection • Policy on Internal Disclosure of Information Concerning Wrongdoing in the Workplace (14) • Clear accountability of functions and roles established at each stage of decision making		
	III-4 Decision makers should take care to exclude personal and political views in formulating the questions to be addressed, and science advisors should clearly distinguish scientific fact and judgement from personal views in their advice.	13.0 Are there codes of conduct for the provision of science advice?	• S&T advice code of conduct		
IV-Uncertainty and Risk *Science in public policy*	*IV-1 Departments should adhere to a government-wide set of risk management*	14.0 Are research and policy personnel familiar with risk management guidelines, and do	• Departmental and interdepartmental risk frameworks		

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always contains uncertainty that must be assessed, communicated and managed. Government should develop a risk management framework that includes guidance on how and when precautionary approaches should be applied.	*guidelines, once they have been developed, to maintain confidence that a consistent and effective approach is being used across government.*	they apply them in their work?	• Implementation of the precautionary principle (19) • Addressing TBS Integrated Risk Management Framework (18) • Decision-making framework (6) • Access to training on risk assessment, risk communication and risk management		
	IV-2 Scientists and science advisors should ensure that scientific uncertainty is explicitly identified in scientific results and is communicated directly in plain language to decision makers.	15.0 How is scientific uncertainty (or confidence) communicated to policy analysts and decision makers? 15.1 Do studies and policy options address confidence limits? 15.2 What mechanisms exist to communicate the nature and degree of uncertainty and risk?	• Risk committees (3) • Uncertainty parameters specified in science advice		
	IV-3 Decision makers should ensure that scientific uncertainty is given appropriate weight in decisions.	16.0 Do briefing materials contain a discussion of scientific uncertainty and risk management approaches? 16.1 Have decision makers been informed of risk assessment and management implications?	• Risk assessment/risk management training for decision makers		
	IV-4 Starting well before decisions are made, scientists, science advisors and decision	17.0 What procedure and mechanisms exist to discuss with stakeholders and the public	• Designated science spokesperson(s) appointed		

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	makers should communicate to stakeholders and the public the degree and nature of scientific uncertainty and risks, as well as the risk management approach to be used in reaching decisions.	scientific risk and uncertainty? 17. 1 Do consultation documents explicitly discuss scientific uncertainty and risk?			
V-Transparency and Openness *The government is expected to employ decision-making processes that are open, as well as transparent, to stakeholders and the public.*	*V-1 Decision makers should balance the need for timeliness in reaching decisions with the need for effective consultation, while recognizing that transparency is always imperative.* *V-2 Decision makers should provide early warning of significant policy and regulatory initiatives to key interest groups and other governments or international organizations, as appropriate.* *V-3 Departments should make publicly accessible, on an ongoing basis, all scientific findings and analysis underlying decisions, and demonstrate how the science was taken into account in the decision making or policy formulation*	18.0 Are there procedures and policies that address consultation and transparency? 18.1 Are there mechanisms that allow decision makers to provide early warning to interest groups, other governments or international organizations of significant policy and regulatory initiatives? 18.2 Are there procedures and mechanisms for making timely information available to the public about the scientific basis for decision making?	• Transparency guidelines • Decision input and review mechanisms • Consultation plan • Open sharing of scientific data • Timely publication of results • Media engagement strategies • Media training • Proactive public involvement strategies • Published records of decision and policy advice		

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	V-4 Departments should consider using a variety of means (including Web sites, press releases, newsletters, direct communication with stakeholders, public meetings, etc.) to present policy. Science advisors should be given a leading role in explaining their advice, while policy officials should describe how the science advice was secured and how the policies or regulations have been framed in light of the advice. *V-5 Inevitably, circumstances arise where scientific conclusions conflict with existing policies, or where government scientists believe their findings or advice are being muzzled. In these cases, departments should employ a well-defined and transparent procedure involving review by departmental management and then, if necessary, examination by a third party. The process should emphasize early*	19.0 Is the department maximizing the use of the communication tools available to it to explain science policy decisions? What kind of communication tools are used? 19.1 Do mechanisms exist for considering and responding to dissenting opinions, minority viewpoints and traditional knowledge?	• Scientific spokesperson(s) appointed • Use of communication channels to explain S&T advice • Established internal and external science conflict resolution procedures • Whistleblower protection for scientists • Minority input consideration (15) • Science liaison officers • Publication of dissenting views in addition to consensus opinions arising out of the scientific peer review processes		

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	conflict resolution and ensure departments do not restrict release of scientific findings that meet the guidelines for sound science.				
VI-Review *Subsequent review of science-based decisions is required to determine whether recent advances in scientific knowledge have an impact on the science advice used to reach the decision.*	*VI-1 Departments should establish a follow-up procedure that documents the government's actions in response to science advice and recommendations. Departmental responses should become part of the official record and provide a useful input to subsequent reviews.* *VI-2. Departments should review key decisions to determine whether recent advances in scientific knowledge affect the science and science advice used to inform the decision. The time period for review should depend on the state of the science (for example, the level of uncertainty, the rate of change in the scientific knowledge, etc.) and should be identified at the time the decision is made (for example, establish a "best before" date*	20.0 Does the department have effective follow-up procedures? Are mechanisms in place for follow-up? 20.1 To what degree does the department undertake post-mortems of important science policy decisions? 20.2 Are past science policy decisions reviewed on a regular basis in light of new scientific information? Are there effective procedures and mechanisms to periodically review past science decisions in light of new scientific information?	• "Lessons learned" reviews • Post-decision monitoring programs • State-of-the-art science reviews • Performance measurement framework (12)		

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	for the science advice).				
	VI-3 When asked to review past decisions, and the science and science advice that supported them, science advisors should have access to all relevant information, including previous analyses and official responses.	21.0 Does the department have procedures for retaining corporate S&T knowledge?	• Knowledge management strategies, programs • External peer review (20)		

3.0 COMMON TOOLS AND DOCUMENTS

The Assistant Deputy Ministers Committee on Science and Technology, recognizing an opportunity for science-based departments and agencies to collaborate and cost-share the implementation of the Framework, struck an interdepartmental Sub-Committee on Science and Technology Advice. The Sub-Committee undertook the following initiatives:

- development of a guide and self-assessment worksheet for science and policy managers (Section 2.0);
- creation of a science advice checklist for the preparation of Cabinet documents (Section 3.1);
- organization of an interdepartmental workshop on best practices in the use of S&T advice (Section 3.2); and
- design and delivery of a pilot training course on S&T advice in policy (Section 3.3).

The main purpose of these efforts was:

- to help departments and agencies embed the Framework in their advisory and decision-making processes by providing tools that would assist with planning, assessing and demonstrating adherence to the Framework; and
- to present opportunities to share knowledge, experiences and good practices in the use of science and technology advice.

The following sections describe three of the initiatives undertaken by the Sub-Committee on S&T Advice.

3.1 Science Advice Checklist for Cabinet Documents

An interdepartmental committee under the chairmanship of the Privy Council Office (PCO) prepared a science advice checklist (see Appendix 6) for Memoranda to Cabinet (MCs) and Regulatory Impact Assessment Statements (RIASs). The checklist is aimed at informing senior officials of a department and their Minister about the science and technology advice processes leading to policy formulation and decision making. (An example of a completed checklist relating to a RIAS undertaken by the Canadian Wildlife Service of Environment Canada is provided in Appendix 7.)

There is no requirement to submit the completed checklist along with the MC or RIAS. However, it should be acknowledged in Cabinet documents that the federal Framework for Science and Technology Advice has been adhered to, and information should be provided in the Cabinet document on the sources of science advice, levels of uncertainty and risk, and recommended review period, at a minimum.

The checklist could also serve as a useful planning tool to ensure that all the requisite aspects of a science and technology advisory process are in place or planned for.

3.2 Best Practices Workshop

In October 2001, Natural Resources Canada (NRCan) hosted the first federal workshop on Best Practices in Science and Technology Advice, which was attended by representatives of over 15 federal departments and agencies (approximately 100 participants).

Seven case studies were presented at the workshop by representatives from the five natural resources departments as well as the Department of National Defence and Industry Canada. The case studies highlighted the unique approaches employed, the barriers that were overcome and the lessons learned. The case studies demonstrated that there is no one best approach or best practice when it comes to developing, communicating and using science advice, but a series of good approaches led by competent and committed individuals.

The workshop also offered an opportunity for the participants to examine the Framework principles in more detail, and to identify some of the key issues and challenges related to their interpretation.

A number of the good practices raised at the workshop have been included in the self-assessment worksheet.

3.3 Science and Technology Advice in Policy Training Course

Environment Canada and NRCan developed a two-day pilot training course designed to ensure a common understanding of how science and technology advice and decision making interact in the policy process, examine the key stages of decision making and enhance awareness of the Framework and its specific principles and guidelines.

4.0 CCMD ROUNDTABLE REPORT

Recognizing that another key element to ensuring effective use of science and technology advice is strengthening the interface between science and policy, the Canadian Centre for Management Development (CCMD) struck a Roundtable on Science and Public Policy to explore the nature of this interface.

The Roundtable, chaired by Art May, was struck in early October 2001. The objectives of the Roundtable were to explore the relationship between the federal government's science and policy communities and to identify how to strengthen the effective use of science in federal policy formulation.

The Roundtable reviewed international developments on science advice, inventoried work already underway federally in the area of science advice, and examined formal and informal science policy mechanisms used within and across member organizations. The Roundtable decided to focus its attention on the culture differences between the science and policy communities.

Dialogue sessions were held in Ottawa, Halifax and Victoria. During the dialogue sessions, participants were asked to discuss two key questions: (1) the issues that hinder integration between the two communities; and (2) what managers can do to improve the science-policy interface.

The information from the Roundtable discussions and the dialogue sessions was captured in a final report entitled, *Creating Common Purpose: The Integration of Science and Policy in Canada's Public Service.* The report proposes a new paradigm, "one which integrates science and policy functions around key issues, and provides the common purpose of working together to solve problems."[11] To achieve this common purpose, the report suggests ways organizations can foster better integration between the two communities (see Appendix 8 for additional information).

[11] *Creating Common Purpose: The Integration of Science and Policy in Canada's Public Service.* CCMD Action-Research Roundtable on Science and Public Policy. Canada. March 2002.

APPENDIX 1
FREQUENTLY ASKED QUESTIONS

Here are answers to some of the most commonly asked questions about the Framework.

1. What is the Framework?

In 2000, the Government of Canada adopted the Framework for Science and Technology Advice and committed all departments and agencies to full implementation by March 31, 2003. The Framework, a federal policy, consists of a series of principles, guidelines and implementation measures that will ensure that government policy, regulatory and management decisions are informed by sound science and technology advice. The Framework's six principles and 26 guidelines are the key elements of any science advisory mechanism.

2. What is the Framework based on?

In 1998, Cabinet asked the Council of Science and Technology Advisors (CSTA)[12] to develop "a set of principles and guidelines for the effective use of science advice in making policy and regulatory decisions." The impetus was the government's belief that more effective use of science advice could diminish science-related crises of public confidence. The resulting CSTA report, the SAGE report, called on science-based departments and agencies to ensure that their science advisory processes would "lead to sound government decisions, minimize crises and capitalize on opportunities." In response to the SAGE report, the Government of Canada developed the Framework for Science and Technology Advice.

3. Is the Framework critical of current practices?

Not at all. The principles and guidelines espoused in the Framework are consistent with many of the current practices in Canada and elsewhere. Neither the SAGE report, upon which the Framework is based, nor the government's response (the Framework) should be taken as a fundamental criticism of current science or science advisory processes. In the majority of cases, government science and science advice are operating in ways that are consistent with the Framework principles. However, before the CSTA elucidated a consistent set of government-wide principles – and departments started adopting them – there was no benchmark against which departments and agencies could test the robustness of their science advisory processes. That is not to say that science advisory processes were not working well, but rather that there was no way of knowing, because there were no explicit principles against which to test them.[13] The

[12] The CSTA was established to provide the Cabinet Committee on Economic Union (CCEU) with external expert advice on internal federal government science and technology issues that require strategic attention. CSTA members are nominated by federal science-based departments and agencies. For more information, see **Error! Bookmark not defined.** (This work draws heavily from the work of Sir Robert May (UK), David Beckler (US), Willlie Smith (NZ) and others.)

[13] In many instances, departments and agencies had evolved implicit principles but had not clearly or consistently applied them, either internally or across departments and agencies.

expectation is that most current processes will be found to be working well, but that some could benefit from fine-tuning.

4. Is the Framework prescriptive?

No. It was recognized that it would be difficult to formulate detailed guidelines that could be uniformly applied across all science-based departments and agencies (SBDAs). Due to the diversity of science, policy and regulatory functions that SBDAs engage in, the Framework allows for flexibility in its implementation.

5. What do "policy," "science," "science advice" and "technology advice" include?

Policy can be categorized at different levels, involving different subject matter and through different modes of expression.[14] Policy typically includes statutes and laws (including international treaties and protocols), statements and speeches, regulations (delegated legislation), guidelines, codes and directives, and information and communications programs.

Policy is developed at different levels, such as horizontally across the Government of Canada (and internationally), horizontally across departments, vertically within a given sector or branch of a department, regionally within a department or across several departments and other levels of government, and at the level of micro cases or individual decisions that set precedents and thus, on a de facto basis, become policy.

Policy encompasses many kinds of subject matter within a department including human resource policy, financial policy, legal policy, S&T policy, environmental and safety policy and international policy. The Framework applies only to S&T policy.

The Framework defines **science** broadly to include "sciences, engineering and technology" and indicates that the principles and guidelines may also be applicable to advice from other disciplines. Science is generally defined as a form of knowledge that is empirical, specific, replicable, verifiable and often quantifiable.[14] The scientific process (or processes) involves a series of activities in which the scientist or teams of scientists collect and observe data, develop models and test hypotheses regarding expected causes and consequences of the given phenomena being studied, publish findings and conclusions, and undergo peer review of their work.

Science advice is defined in the Framework as "value-added guidance deriving from scientific and technological knowledge, theories, data, findings, and conclusions, to inform policy, regulatory and management decision making."

Technology advice is generally defined as the application of knowledge as a means or technique for achieving largely predetermined purposes.[14] That is, technology advice may be needed to provide workable regulations or actions to actually implement any given policy.

[14] Bruce Doern, "A Pilot Course for EC and NRCan. Science and Technology Advice in Policy." 2001.

6. Does the Framework apply to both science and policy activities?

In short, yes. The principles put forward in the Framework are meant to apply both to the conduct of science and to the processes by which science is translated into policy. The Framework states that:

> *These principles and guidelines address science advice as one input in government decision making. Clearly, decision making in government must consider a wide range of other inputs (including traditional knowledge, ethical and cultural considerations, etc.) and consult, as appropriate, advisors competent in many aspects of public policy (including law, public administration, international affairs, etc.). Decision makers must exercise their legitimate role to weigh these multiple inputs and make choices.*

However, the Framework does not apply to *every* policy process – only to those that have (or should have) an S&T component. So, implementing the Framework requires departments and agencies to focus primarily on their science policy processes, not all processes. Moreover, not every science advisory process needs to reflect every principle or guideline in the Framework. In many instances (e.g., when there is a need for commercial confidentiality), it will not be possible to apply every aspect of the Framework to a given science advisory process.

Similarly, departmental science advisory processes may rely on more than just one advisory mechanism. What is important is that departments and agencies can show how their advisory processes work together to support decision making.

7. Whose job is it to lead the Framework implementation process?

Science advice champions will be held accountable for progress in their department or agency. It is also expected that there may be an independent review of progress by the Auditor General. Each department will determine its own approach for applying the Framework to its science policy activities.

The S&T Assistant Deputy Ministers Committee is tasked with reviewing the results of departmental activities to discuss and communicate examples of best practices in the use of science and technology advice. Government-wide reporting of progress will take place through the S&T Annual Report.

8. Does the Framework apply to me?

Whether you're a scientist, technologist, advisor, policy analyst, manager or decision maker, the Framework applies to you. The Framework encourages the key players to work together to ensure:

- timely identification and communication of emerging issues;
- inclusive, open and transparent processes;

- development, assessment and communication of advice, free from conflicts of interest and biases;
- regular reviews of decisions and policy actions; and
- consistent approaches to risk assessment, management and communication.

More and more, it is up to individuals to monitor and assess their own work and the advisory processes they are a part of, in a system of continuous improvement. Understanding and applying the Framework can help you to assess and, if necessary, improve the science advisory processes that you are engaged in. Researchers and policy analysts should be aware of the principles and guidelines in the Framework so they can provide the best possible research and analysis. Managers should ensure that the advisory processes they are responsible for conform to the Framework. Decision makers can use the Framework to assess whether they are receiving the best possible advice.

9. What is the purpose of the self-assessment worksheet?

The purpose of the worksheet is to provide some methods and approaches that can be used for the Framework review process. The idea is to create an accountability trail that would make an external observer confident that departments and agencies have indeed reviewed their science advisory processes to demonstrate adherence to the Framework.

Use of the self-assessment worksheet isn't mandatory. Each department or agency is encouraged to determine its own approach to adhering to the Framework in the context of previous activities, resources, individual circumstances, and so on. Whatever approach is selected, it should ideally lend itself to creating an accountability trail so that departmental adherence to the Framework can be documented.

10. What's the bottom line?

What is the point of the Framework? Why has the government committed itself to adopting its principles and guidelines? In the words of the Framework:

> *Canada requires a science advisory process that leads to sound government decisions, minimizes crises and capitalizes on opportunities. An effective advisory process brings both sound science and the best science advice to bear on key issues, and ensures that:*
>
> - *Ministers are confident that a rigorous and objective assessment of all available science was made in providing the advice;*
> - *credible science advice is considered by decision makers; and*
> - *the public and parliamentarians are confident that government is using science in the best interests of all Canadians.*

The desirable outcome is decision making that is informed by sound science and technology advice and greater public, parliamentarian and ministerial confidence in these decisions.

11. Whom can I contact for more information?

Many departments and agencies have appointed representatives to the interdepartmental Sub-Committee on Science and Technology Advice. (Appendix 3 contains a list of these representatives.) The committee guided the development of a number of the Framework tools and documents.

APPENDIX 2
A STEP-BY-STEP GUIDE TO IMPLEMENTING THE FRAMEWORK

1. Getting Started

Each department has appointed (or will appoint) an S&T advice champion for the Framework. Each champion is responsible for implementing the Framework within his or her own department or agency and for liaising with the overall government work on the Framework. In many instances, champions will designate staff to work with them on the Framework implementation project and to deal with day-to-day requirements.

Essentially, departments and agencies are being asked to assess their science and policy processes against the six principles and accompanying guidelines contained in the Framework. For the most part, it is envisaged that assessment will be conducted internally by line staff. Individuals who manage the various departmental science policy processes – typically directors or directors general – are best placed to assess the processes for which they are responsible. However, this will vary among organizations, and each should consider which personnel should be involved. In some cases, organizations may wish to call on external parties to help with an assessment.

2. Who Is Responsible

It is envisaged that the following people will likely be involved in assessing the department's or agency's adherence to the Framework (these are suggested responsibilities only, and organizations may well decide to use a different procedure to handle their Framework requirements):

Deputy Ministers: DMs will assign responsibility for application of the Framework to a designated departmental Framework champion.

Framework Champion: Framework champions (typically an ADM) will have primary responsibility within their department for implementing the Framework and reporting on progress. Champions will be responsible for reporting on progress to science ADMs.

Staff Co-ordinator: This is an optional position established at the discretion of the Framework champion. The co-ordinator will work under the direction of the champion to manage or co-ordinate the self-assessment process within the department, the assessment of departmental files, and the assessment of interdepartmental files. The co-ordinator will also prepare departmental reports.

Managers: These individuals – typically directors or directors general – will be responsible for (self-)assessing the science policy processes for which they are responsible.

3. The Step-by-Step Process

Following are a number of steps that a department or agency would typically undertake to demonstrate adherence to the Framework for S&T Advice. These are suggested steps only, and organizations should feel free to amend them if they choose.

3.1 Assemble a Framework Implementation Team

The first step for each organization is to assemble a Framework team. The team will, at a minimum, consist of the S&T advice champion, typically an ADM. In most instances, organizations will want to provide the champion with staff assistance, perhaps in the form of a Framework co-ordinator. The champion and (where designated) the co-ordinator will decide if the department should convene a larger Framework implementation committee, which could represent and liaise with all parts of the department.

3.2 Review the Framework

At an early stage, all those involved with the project should familiarize themselves with the Framework for S&T Advice. So that they understand the context of the exercise, they might also find it helpful to consult the SAGE report, on which the Framework is based.

3.3 Develop an Implementation Plan or Strategy

A departmental implementation plan or strategy may be developed that reflects the mandatory implementation measures in the Framework as well as specific departmental areas requiring improvement.

The plan or strategy, along with the Framework, should be broadly communicated in the department.

3.4 Review S&T Advisory Processes

Using the worksheet included in this guide (Section 2.4), each manager (director or director general) should be accountable for assessing the science advisory mechanisms for which he or she is responsible. For those processes where improvements are required, they should document how the improvements will be made, and when. The managers may wish to forward completed self-assessments, along with desired improvements, to the co-ordinator.

3.5 Report on Results

The Assistant Deputy Ministers Committee on Science and Technology is required to review the results of the assessments (evaluations) in order to share and report on best practices in future federal S&T annual reports.

APPENDIX 3
LIST OF MEMBERS OF THE SUB-COMMITTEE ON SCIENCE AND TECHNOLOGY ADVICE

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Science Policy and Planning Committee
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Canadian Food Inspection Agency
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Microbiologist
Office of the Associate Vice-President of Science Evaluation
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Fax: (613) 228-6638
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APPENDIX 4
DEFINITIONS

Following are the definitions used in this guide. Most of these definitions are from the Framework for S&T Advice.

Decision Maker

Anyone with the authority to make decisions in the federal government. In general, this typically involves ministers and deputy ministers, but it may also include assistant deputy ministers, directors general and other senior officials in certain matters.

Department

The Framework was developed for application primarily by federal government science-based departments and agencies. However, given the growing pervasiveness of science and technology, the principles and guidelines will be of increasing importance to all departments called upon to make decisions related to science. For the purposes of the Framework, departmental responsibility rests with the deputy minister or other senior managers, as appropriate. As recommended in this guide, responsibility for implementing the principles and guidelines should rest with the departmental science advice champions.

Due Diligence

Means that reasonable steps (includes rigorous internal and external review, and assessment of all findings, analyses and recommendations) have been undertaken to ensure sound decision making.

Independent External Scientific Advisory Body

A committee, either ad hoc or standing, that is at arm's length from the federal government and is composed of scientific experts whose knowledge is relevant to the issue being examined. Typically such bodies are set up on an "as required" basis by an external scientific organization (professional society, learned society, research institute, etc.) at the request of the federal government.

Policy Advisor

Anyone engaged in the formulation and provision of policy advice within the federal government. In general, this refers to policy analysts and advisors who work at the interface between those who contribute advice and senior managers or decision makers.

Precautionary Approach

According to the 1992 Rio Declaration, "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." Beyond threats to the environment, this concept is increasingly being applied in cases involving threats to public health and safety.

Representative Stakeholder Committee

An existing or newly formed committee that represents a broad range of stakeholders, typically including representatives from industry and non-government organizations.

Risk

A concept that combines the probability that an adverse event will occur and the consequences of the adverse event.

Risk Management

Used broadly to include the assessment of risk, the communication of risk and the process of identifying, analysing, prioritizing, implementing and evaluating actions to reduce risk. The goal of risk management is scientifically sound, cost-effective, integrated action that reduces or prevents risks while taking into account social, cultural, ethical, political, economic and legal considerations.

Science

Broadly defined to include the sciences, engineering and technology. The principles and guidelines may also be applicable to advice from other disciplines.

Science Advice

Value-added guidance deriving from scientific and technological knowledge, theories, data, findings and conclusions to inform policy, regulatory and management decision making.

Science Advisor

A person who engages in the formulation and provision of science advice. Often scientists will fill this role.

Scientist

A person who has expert knowledge of science and who is typically engaged in the conduct of science. "Government scientist" refers to a scientist employed by the federal government.

Stakeholder

A person or group that has an interest, economic or otherwise, in the outcome of government decisions, policies or regulations.

Traditional Knowledge

Knowledge that is acquired and preserved through generations in an original or local society. Both Aboriginals and non-Aboriginals may possess traditional knowledge.

APPENDIX 5
GLOSSARY OF GOOD PRACTICES

1. Science and Technology Foresight

S&T foresight involves systematic attempts to look at the longer-term future of science and technology, and their potential impacts on society, with a view to identifying the emerging change factors, and the source areas of scientific research and technological development likely to influence change and yield the greatest economic, environmental and social benefits during the next 10-25 years.[15]

Under the Federal Innovation Networks of Excellence (FINE) initiative, an interdepartmental working group has been formed to run a pilot foresight project. The intent of this pilot project is to test the applicability of foresight techniques for determining future FINE research and development priorities. Initial results from the project are expected in early 2003.
Contact: Jack Smith, NRC (613) 993-7496

2. Technology Maps

Technology maps are a structured methodology that provides an in-depth assessment of the capabilities and challenges associated with a given technology, as well as a comprehensive guide to the many commercial development parameters, issues and uncertainties behind successful technology commercialization. They can serve as a basis for research agenda, priority setting and networking activities.

3. Risk Committees

At Health Canada, a series of mechanisms has been and continues to be put in place to provide a strong departmental capacity for, and high-level engagement with, quality decision making related to risk:

(1) The Departmental Executive Committee on risk management provides expert leadership, horizontal co-ordination and strategic risk management discussion and advice at the senior management level. It is a forum for discussing options for optimal or most appropriate action based on the best information available.
(2) Risk management committees at the branch, directorate or program level are becoming the norm.
(3) In some cases, branch-level capacities are being developed in risk management, with particular focus on early identification of issues, capacity building, communications and process management.
Contact: Patricia Milsom (613) 941-9087 or Douglas Watson (613) 941-8146, Health Canada

[15] NRC Foresight Presentation.

4. Science Policy Teams

Environment Canada has established four business lines that cut across organizational structures. These business lines are managed by senior departmental managers, who are responsible for setting national direction and ensuring national coherence in program delivery, establishing clear accountabilities for results, and tracking and reporting on performance. Each business line table has identified present and emerging research issues and challenges and has established research agendas that lay out research priorities for the next five years. The business line research agendas improve understanding among departmental managers of the role and importance of scientific research across EC programs, and provide a clear link between research and development and table priorities and programs.
Contact: Linda Crosby, EC (819) 953-3083

5. Science-Policy Linkages

5 (a) Science-Policy Linkages (SPLINKs)
In response to the need for ongoing interaction between science and policy at the departmental level, Natural Resources Canada has introduced regular science-policy linkage or "SPLINK" events. These events bring together science and policy practitioners for open dialogue on a particular horizontal issue or theme.[16]
Contact: Mary McKennirey, NRCan (613) 992-4180

5 (b) National Science Workshops
To build stronger national linkages between scientists and their respective fields of expertise, Fisheries and Oceans Canada holds an annual National Science Workshop. The forum provides scientists from the department's 12 research facilities with the opportunity to network and become familiar with research being undertaken by their departmental colleagues in disciplines other than their own. Approximately 150 participants, including policy and communications staff, attend the annual workshop.

6. Decision-making Framework

Health Canada has adopted a formalized decision-making framework (DMF) as one of its mechanisms to ensure that a multidisciplinary approach is taken when identifying, evaluating, managing, mitigating and communicating health risks. Involvement of interested and affected parties (including partners, the public and other stakeholders) throughout the process, as appropriate, is a central tenet of the decision-making framework. Within the context of the DMF, Health Canada emphasizes public involvement and risk communication to exchange information amongst risk assessors, risk managers, consumers and other interested parties.

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[16] CCMD Roundtable Report, *Creating Common Purpose: The Integration of Science and Policy in Canada's Public Service*.

Health Canada's objective in using a risk management process is to follow a systematic approach in order to achieve scientifically sound and integrated decisions. In addition to a focus on comprehensive scientific assessment, this process takes into account relevant social, cultural, political, economic and legal considerations and ensures the timely dissemination of information.
Contact: Dr. Judith Glennie, HC (613) 946-6512

7. Inventory of Experts

7 (a) Health Canada's Science and Research Database provides a forum for departmental scientists and researchers to contribute information on their areas of expertise, science and research interests, current projects, specialized equipment and methodologies used, and other related information. The database provides HC scientists and researchers with a tool for networking and identifying potential collaborators as well as facilitating information sharing among the science, research, policy and program communities.
Contact: Stephanie Wilson, HC (613) 946-5606

7 (b) Environment Canada is developing the S&T Community yellow pages. The yellow pages are a Web tool for finding people or organizations within EC's S&T community based on expertise, issues and/or location. This initiative will help EC collaborate and share knowledge, work better horizontally across the organization, utilize better the expertise and experience in the department and avoid duplication.
Contact: Shealagh Pope, EC (819) 953-4078

8. Science Assessments

Science assessments play a key role in providing succinct, state-of-the-art scientific reviews of complex issues. Science assessments are utilized by Environment Canada to deliver scientific knowledge and information to the scientific community, policy analysts and decision makers.

9. Web Consultations and Communications

The CEPA Registry is a comprehensive, online source of public information relating to activities under the Canadian Environmental Protection Act. The primary objective of the Registry is to encourage and support public participation in environmental decision making.
Contact: CEPARegistry@ec.gc.ca

10. Science Networks

Science networks are collaborative mechanisms linking different organization or individuals and encouraging sharing of information and exchange of methodologies and forms of practice. These networks ensure collaboration on initiatives such as training, research and development, monitoring and data collection, commercialization and provision of services. Each network usually has a unique governance structure, function, organization and funding arrangement.[17]

11. Citizen Science

"Environment Canada regards Canadian volunteers as the eyes and ears of the department, improving its knowledge and understanding of the environment. Volunteers count birds through such programs as the Christmas Bird Count, listen to and record information on frogs through Frogwatch, gather weather data using Stephenson screens in their backyards, and contribute through a host of other activities. To ensure the quality of its science, Environment Canada uses standard methods for collecting, reporting, managing and analysing these data and provides training and feedback to its volunteers."[18]

12. Performance Measurement Framework

Fisheries and Oceans Canada has developed a performance measurement framework based on the principles and guidelines contained in the Framework for Science and Technology Advice. Annual performance measurement reports will be used to systematically assess the impact of science in decision making on a case-by-case basis.

13. Conflict of Interest

The *Conflict of Interest and Post-Employment Code for the Public Service* requires all government employees to perform their duties in such a manner that public confidence and trust in the integrity, objectivity and impartiality of government are conserved and enhanced. Government employees are required to review their obligations under the Code to ensure that their assets, liabilities and outside activities do not constitute a real, potential or apparent conflict of interest with their duties (http://www.tbs-sct.gc.ca/Pubs_pol/hrpubs/TB_851/CIP_e.html).

14. Policy on Internal Disclosure of Information Concerning Wrongdoing in the Workplace

This policy requires deputy heads to put in place internal mechanisms to allow employees to disclose, in good faith, information concerning wrongdoing within their organizations. These disclosures need to be addressed in an appropriate and timely fashion; as well, employees who disclose information need to be treated fairly and protected from reprisal. Deputy heads and managers should foster a culture of open communication where issues and concerns can be dealt

[17] CESN discussion paper.
[18] Tracking Key Environmental Issues.

with in the workplace, but should also provide an alternative when one is needed (http://www.tbs-sct.gc.ca/Pubs_pol/hrpubs/TB_851/idicww-diicaft1_e.html).

15. Minority Input Consideration

The Canadian Food Inspection Agency's Policy Framework Checklist provides guidance throughout the policy formulation and decision-making processes, identifying issues and ensuring inclusion of all stakeholder opinions. If consensus on the science cannot be reached within CFIA, the issue is referred to the Science Evaluation Unit (SEU) for unbiased scientific evaluation of the minority input or viewpoint. The SEU considers the soundness of the science underpinning the minority opinion and the impacts of including and excluding the information, and recommends how the minority opinion should be considered in policy formulation.
Contact: Dr. Maria Nazarowec-White, CFIA (613) 225-2342, ex. 4597

16. Science Forum

The CFIA holds an annual Science Forum to discuss emerging science and technology issues and how these issues may affect its policies and programs. Participants (100-150) include members from all CFIA branches, including Programs, Operations, Human Resources, and Public and Regulatory Affairs, from all areas of the country, as well as representatives from federal, provincial and territorial agri-food sectors. Through focused roundtable discussions, participants develop recommendations on emerging science and technology issues. The recommendations are presented to senior management. Implementation of recommendations is reviewed six months and then two years after each forum.
Contact: Dr. Maria Nazarowec-White, CFIA (613) 225-2342, ex. 4597

17. Guidelines for Expert Panels

The Royal Society of Canada has drafted a procedures manual for expert panels. This manual may serve as a useful guide on such issues as assembly of expert panels, panel procedures, addressing possible biases, conflict of interest considerations, etc.
(http://www.rsc.ca/english/expert_manual.pdf).

18. TBS Integrated Risk Management Framework

The Treasury Board Secretariat's Integrated Risk Management Framework is the federal government's own policy on integrated risk management. The objective of the Risk Management Framework is to assist public service employees in strengthening their ability to anticipate, assess and manage risk, and make decisions (http://www.tbs-sct.gc.ca/pubs_pol/dcgpubs/riskmanagement/rmf-cgr01-1_e.html).

19. PCO Precautionary Principle

The government, led by the Privy Council Office, has been working on an initiative to discuss the application of the precautionary approach, or precautionary principle, in science-based regulatory

programs. The precautionary approach is distinctive within science-based risk management. The Assistant Deputy Ministers Working Group released a discussion document (http://www.pco-bcp.gc.ca/raoics-srdc/default.asp?Language=E&Page=Precaution&Sub=Discussion) on a proposed principle-based framework to guide the application of the precautionary principle in risk management decision making. This is an important step toward establishing a federal framework for coherent and consistent application of the precautionary approach in Canada.

20. External Peer Review

Fisheries and Oceans Canada undertook an external peer review of its greenhouse gas research programs to seek guidance and a rationale for continuing projects that are considered essential, to identify any redirection needed and to chart future paths. The review panel assembled an inventory of departmental greenhouse gas research programs for the last 10 years and provided a candid assessment of these efforts, in addition to recommendations.

21. Peer Review

The Canadian Science Advisory Secretariat (CSAS) within Fisheries and Oceans Canada co-ordinates the peer review and provision of advice on scientific issues for the department. The formalized peer review process is applied to a number of issues, ranging from the status of stocks to the impact of oil and gas exploration and development on aquatic ecosystems. The process engages scientific expertise internal and external to the department as well as traditional knowledge. The goal is to achieve full consensus on the soundness of all information under review and its implications for decision making. If full consensus cannot be achieved, dissenting views are included as an annex to the written meeting proceedings. Formal terms of reference for each peer review help to ensure that the review is aligned with the science advice requirements of decision makers and that important concerns are captured and addressed by the science community. Guidelines for external participation in the peer review process have been established to clarify objectives, the role and requirements of participants, and knowledge criteria. Scientific information and advice (research documents, status reports, proceedings) arising from the peer review process is published on the CSAS Web site (http://www.dfo-mpo.gc.ca/csas) in a timely fashion. When interest warrants, consensus scientific opinion is immediately communicated to Canadians via media briefings.
Contact: Dr. Jake Rice, Director, Assessment and Peer Review, Canadian Science Advisory Secretariat, DFO (613) 990-0288

22. Departmental Science-Policy Discussion Fora

The Policy Committee within Fisheries and Oceans Canada performs a critical science and policy interface function that enables the review of major science initiatives (e.g., Memoranda to Cabinet, Treasury Board submissions, DFO policy proposals) that are being brought forward for consideration by the Departmental Management Committee in preparation for presentation to the Minister. The Policy Committee and its parallel Shadow Policy Committee consisting of director generals ensures that the science aspects of departmental policy proposals and/or Memoranda to Cabinet are appropriately reflected in the proposal and decision-making process.

APPENDIX 6
SCIENCE ADVICE CHECKLIST FOR THE PREPARATION OF MCs AND RIASs

(Basic questions to promote the effective use of science and technology advice in government decision making)

Issue	Inclusiveness	Sound Science/ Science Advice	Uncertainty and Risk	Transparency and Openness	Review
1. What is the issue? Outline the background, magnitude and implications. 2. What role do S&T considerations play in the development of policy options? 3. What is the public's understanding of the scientific background of this issue?	1. Have the scope and implications of the scientific basis for this issue been explored with related disciplines and departments, including social sciences and sources of traditional knowledge? 2. What process was used to provide science advice? In-house expertise, external expertise, international expertise, or a combination of the above? 3. Was an external, independent body engaged to advise on this issue? What was the rationale for this decision, and what were its conclusions and recommendations?	1. What measures have been taken to avoid (or manage) potential or real conflicts of interest on the part of the science advisors? 2. What measures have been taken to ensure the quality, integrity and objectivity of the science advice? 3. How were science advisors involved in the identification and assessment of policy options, and how was their advice reflected in the options presented to decision makers?	1. What is the nature and degree of the scientific and technological uncertainty and risk related to this issue? 2. How was the scientific and technological uncertainty dealt with in formulating policy options? 3. How was the government's Integrated Risk Management Framework applied in addressing this issue?	1. Was an existing or representative set of stakeholders selected to comment on the development of policy options? How was this group chosen? 2. How were the public and stakeholders informed as to: a. the degree and nature of the scientific uncertainty and risks, and the risk management approach(es) utilized? b. how science was taken into account in the decision-making and policy formulation process? 3. What public consultation was undertaken on the policy options? How have stakeholder views and public concerns been taken into consideration?	1. What tools and mechanisms are in place for monitoring, measuring and reporting on the scientific implications of the policy? 2. What are the provisions for a review of the science and the decisions (based on a set time period or on significant changes in the science or policy)?

APPENDIX 7
CASE STUDY EXAMPLE: OVERABUNDANT SNOW GEESE
CANADIAN WILDLIFE SERVICE (CWS)

Issue

1. What is the issue? Outline the background, magnitude and implications.

The issue is the recent rapid increase in the abundance of snow goose populations, causing negative effects on wildlife habitat. Populations of greater and mid-continent lesser snow geese have risen dramatically in recent decades. The rapid growth is attributed to increased food availability during winter months from agricultural operations, and a declining rate of mortality. As a result, these birds are no longer limited by the carrying capacity of winter habitat, as they were previously. Analysis of the effects of increased numbers of snow geese on staging and arctic breeding habitats shows that unsustainable levels of foraging are adversely affecting the key habitats for migratory birds and other wildlife. Left unchecked, overabundant snow goose populations may become seriously injurious to their own long-term survival and to that of other migratory birds, compromising the biological diversity of the arctic ecosystem.

Ultimately, a number of actions were undertaken, with the goal of protecting and restoring the biological diversity of arctic wetland ecosystems and the ecosystems of important migration and wintering areas. Some actions would require regulatory amendments; and whether, how and when to implement such regulations was controversial. It was determined that to curtail the rapid population growth and reduce population size to a level consistent with the carrying capacity of breeding habitats over a period of about five years, the mortality rate would have to be increased by two to three times the level of the past decade. To this end, beginning in 1999 an amendment to the Migratory Birds Regulations created special conservation measures that permitted hunters to hunt overabundant geese outside the regular hunting season and, in some cases and subject to specific controls, to use special methods and equipment, such as electronic calls and bait, to increase hunter success. Additional management options, such as altered management of refuges, did not require regulatory actions.

2.What role do S&T considerations play in the development of policy options?

The key indicator that the growing snow goose population was becoming overabundant was the deterioration of the natural vegetation communities at important staging areas. Research and science advice was basic to the identification of the issue and development of policy options. In this case, we were fortunate to have had 30-plus years of monitoring and research on snow goose populations, including indices to their abundance, survival rates, productivity and other parameters. In addition, an extensive university research program had conducted many years of intensive study of the vegetation communities, and their use by geese, at the important staging area and nesting colony at LaPerouse Bay, Manitoba. This information allowed identification and description of the problem and provided the data needed to develop viable policy options. Scientific evidence for greatly increased snow goose abundance and their negative effects on

habitat was critical for credible issue identification. Much of the information had been published in peer-reviewed scientific journals.

Potential policy options were identified and evaluated using mathematical population models. The key questions were to determine: (1) whether intervention was required and, if so, (2) the magnitude of population reduction required, and (3) the magnitude that could be achieved under various scenarios.

The results of the modelling exercises indicated that without intervention there would be continuing degradation of natural habitats and related effects on the biological diversity of the ecosystem. The snow goose population would likely decline naturally in the future through poor summer nutrition and increased predation and disease. Natural self-regulation of the population was considered unacceptable because the effects would be felt by all species dependent on those habitats. Initial estimates of the required population reduction were made, and sensitivity analyses showed that reducing adult survival would be the most effective approach.

3. What is the public's understanding of the scientific background of this issue?

Initially, public understanding of the issue of habitat damage was limited because the key staging habitats and the arctic ecosystem are not directly observable by the majority of citizens. Complex interactions between nesting and staging habitats of highly migratory species in isolated northern environments are not likely to be directly discerned. However, some members of the public did have direct exposure to the effects of the population increase, as they experienced increased crop damage and/or increased birdwatching opportunities.

Throughout the development of our approach to this issue, documents were produced to describe the scientific background. These materials were mailed to more than 700 interested groups and individuals, and made available on government Web sites. This helped the issue to gain substantial media attention (both supportive and critical of the government's conclusions and actions), including many newspaper and magazine articles and a number of television and radio items. Based on the evidence of correspondence received and local public opinion surveys, the public's understanding of the scientific basis for the issue increased considerably through the years as a result of the media attention as well as our own dissemination of information.

Awareness of the scientific background of an issue does not, in and of itself, imply agreement with the proposed actions. Some regional public opinion surveys seeking a response to proposed management options found a majority to be in favour of the types of actions ultimately invoked. On the other hand, EC was taken to court by a coalition of animal protection groups opposed to any form of intervention. They disputed the evidence of the extent of habitat damage caused by overabundant goose populations, and the unprecedented numbers of snow geese, and maintained that natural reduction of population size by starvation, disease and predation would be preferable to increased harvest by hunters. The controversial nature of the issue was noted by the federal court judge, who said that he was "pleased to be the judge rather than the responsible Minister" and that "while it was not an easy decision for the Court, it was an even more difficult decision for the Government." The federal court ruled that the Government of Canada does indeed have

the authority to make these special regulations, and a subsequent appeal was dropped. The court made note of the scientific evidence and degree of consensus, and ruled that the proposed measures were warranted for snow geese but were "ultra vires" for a similar-looking species because "the case had not been made."

Inclusiveness

1. Have the scope and implications of the scientific basis for this issue been explored with related disciplines and departments, including social sciences and sources of traditional knowledge?

The other key scientific discipline was agriculture, and advice from experts in this field (provincial and federal) was sought through the stakeholder consultation process described later in this document. In addition, local knowledge was sought from Aboriginal people in affected areas, primarily in Nunavut.

2. What process was used to provide science advice? In-house expertise, external expertise, international expertise, or a combination of the above?

The first serious raising of the issue took place in January 1995 at an International Arctic Goose Conference, where the international scientific community (internal and external to the government) spoke to CWS and the United States Fish & Wildlife Service (USFWS) with one voice on the seriousness of the effect of overabundant snow goose populations on arctic wetland ecosystems.

Following this, CWS convened an international workshop in October 1995 to hear the diversity of scientific opinion. At its conclusion, teams of Canadian and American experts were assembled to develop an assessment of the environmental effects of the rapidly growing populations of snow geese. The group became known as the Arctic Goose Habitat Working Group (AGHWG). The experts included population modellers, harvest management biologists, habitat biologists, botanists and goose population experts drawn from government and non-government organizations. The consensus among members of the working groups, all with high standing in the scientific community and extensive experience working on arctic habitats, lent weight to their findings. The working group sought advice from other scientists as needed. Their analyses were published in comprehensive reports entitled *Arctic Ecosystems in Peril – Report of the Arctic Goose Habitat Working Group* and *The Greater Snow Goose – Report of the Arctic Goose Habitat Working Group*. The teams reported to the (pre-existing) Arctic Goose Joint Venture (AGJV), which in turn made recommendations for action to the two federal governments.[19]

Thus, the process used to develop advice relied on long-standing and substantial expertise on the topic in-house as well as on extensive research programs (some very long term) led by Canadian university researchers. U.S. institutions (federal and state governments, academia and natural history museums) are also involved in significant research projects. These efforts (most of them

[19] The AGJV is an international joint venture of the North American Waterfowl Management Plan (NAWMP).

co-operative) are brought together for discussion in the forum provided by the international AGJV, which makes recommendations to the federal governments.

3. Was an external, independent body engaged to advise on this issue? What was the rationale for this decision, and what were its conclusions and recommendations?

As described above, the science basis for the issue was developed through the work of the AGHWG, or teams of internal and external scientists representing federal, state and provincial governments, academics and Ducks Unlimited. The reasons for establishing the AGHWG were: (1) to address early in the process the potential for the issue to become politically sensitive, and (2) to include all the recognized experts on the issue, some of whom were external to the government. The mandate of the group was to analyse the environmental effects of the growing goose populations, forecast future growth of the goose populations, and make recommendations about whether intervention was needed, and, if so, evaluate intervention options. The group recommended that intervention was essential for conservation and suggested a number of activities that could be undertaken. The AGHWG and AGJV were not completely independent of government because CWS staff co-chair the AGJV and participate on the AGHWG. However, these groups were composed primarily of non-Canadian federal government agencies, and CWS was a minority partner.

The results were presented to the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation and Management. This body brings together the federal wildlife agencies from the three countries, and serves as the primary group for co-ordination of continental conservation activities. The Trilateral Committee agreed that the snow goose populations were overabundant and that each country should undertake measures to address the problem.

To make decisions in Canada, based on the recommendations for action, two separate sets of additional players were asked for advice: those for whom the issue involved the lesser snow goose, and those for whom the issue was related to the other subspecies, the greater snow goose. In the former case, the jurisdictions involved included the three prairie provinces, the Northwest Territories and Nunavut. In the latter case, the main players were in Quebec. While CWS retains full responsibility for regulations affecting the take of migratory birds, the provinces and territories and northern co-management boards could also have roles to play, for example, concerning the management of land.

The key partners are the provinces and territories, with whom we practise co-operative management of migratory birds. A federal/provincial/territorial committee (Canadian National Snow Goose Committee) discussed the results of the science analysis, agreed that intervention was required, and considered the various recommendations for management actions. In Quebec, discussions were held with the provincial wildlife and agricultural agencies through the Technical Committee for the Integrated Management of Greater Snow Geese. These agencies also advised that intervention should be undertaken (this committee is discussed further in the following section).

A great range of management activities was examined, ranging from egg collection to culls to comprehensive revisions of agricultural policy on the wintering grounds. Some of the recommended actions were not permitted under the existing Migratory Birds Regulations and so necessitated regulatory amendments. In particular, the decision to reduce the survival of adult snow geese through increased harvest required that regulations be designed that would permit much higher harvest levels than usual, including outside the dates allowed for hunting by the Migratory Birds Convention.

One independent group that was formed to examine the issue was the International Stakeholders' Committee co-ordinated by the Wildlife Management Institute. Both federal governments were invited to be advisors. The International Stakeholders' Committee agreed that the issue warranted the types of actions being considered, although one member organization (the U.S. Humane Society) submitted a separate dissenting report at the eleventh hour.

Sound Science/Science Advice

1. What measures have been taken to avoid (or manage) potential or real conflicts of interest on the part of the science advisors?

Potential conflicts of interest were avoided by involving science advice from a wide array of recognized experts from a variety of government and non-government organizations. No obvious sources of conflict of interest were apparent, although some critics charged that the experts were in the business of promoting their own research programs to ensure continued funding. A potentially more serious allegation was made by anti-hunting groups: that the majority of people and agencies involved were pro-hunting, and that the management options were thinly veiled attempts to increase hunting opportunities. The allegation did not seem to represent public opinion or garner broad public support.

The scientists and managers in EC are required to divulge any possible conflicts of interest as a requirement of employment and to conduct their personal and professional affairs in such a manner as to avoid perceived or real conflicts of interest.

2. What measures have been taken to ensure the quality, integrity and objectivity of the science advice?

The initial identification of the seriousness of the problem came to light as a result of peer-reviewed publications in scientific journals. Since then, quality control has been managed by involving science advice from a wide array of recognized experts. In addition, advice was sought through international fora with numerous organizations represented (the Canada/Mexico/U.S. Trilateral Committee, the AGJV, the U.S. Flyway Councils). The fact that recognized leaders in research on snow goose biology and arctic vegetation ecology were involved, and that many

peer-reviewed articles on this topic had been published in the scientific literature, helped ensure quality, integrity and objectivity. Additional scientific articles have been published since the initial decision to intervene; their main conclusions were to agree that the government should act, but they predicted that hunters alone would not be able to harvest sufficient birds.

3. How were science advisors involved in the identification and assessment of policy options, and how was their advice reflected in the options presented to decision makers?

Science advisors were active participants in the scientific assessments of the AGHWG and in the development of the slate of subsequent recommendations. Science advice was discussed at length through the Arctic Goose Joint Venture technical committee and management board. The science advisor developed the briefing materials, which were also reviewed by the scientists. Their advice was central in the options presented to decision makers.

Uncertainty and Risk

1. What is the nature and degree of the scientific and technological uncertainty and risk related to this issue?

Scientific Uncertainty: The key scientific uncertainties are whether reduction of the populations will lead to recovery of the vegetation communities and, ultimately, to optimum population sizes. Although the consensus is that the current high populations of snow geese are unprecedented, we cannot say with absolute certainty that populations were never before as high; credible scientific information is not available for comparison. Secondary causes of the snow goose population increase, believed to be primarily the recent availability and use of agricultural food resources, are somewhat uncertain; other factors, such as climate warming, could be involved. There is uncertainty about the geographic extent of the habitat damage throughout the arctic.

Scientific Risk: The main point for risk assessment was to evaluate whether intervention should take place. The risk of not taking action was clear: key habitats for migratory birds and other wildlife would continue to be adversely affected by overuse, compromising the biological diversity of the arctic wetland ecosystems and important staging habitats. On the other hand, modelling showed that the risk of going too far in our response (i.e., putting the snow goose population at risk) was extremely small. It was much more likely that we would not be able to achieve the desired population reduction using the preferred approach of increased harvest by hunters.

Technological Uncertainty: The key technological uncertainty is whether increased access by hunters can reduce the snow goose population sufficiently.

Technological Risk: N.A.

2. How was the scientific and technological uncertainty dealt with in formulating policy options?

The key uncertainties are whether increased access by hunters can reduce the snow goose population sufficiently, whether reduction of the populations will lead to recovery of the vegetation communities and, finally, the ultimate optimum population sizes.

Uncertainties were dealt with by soliciting expert advice and by designing scientific monitoring and evaluation plans. To ensure adequate evaluation, a stepped-up regularized population and habitat monitoring program was formulated. This program has been implemented, although not to the extent recommended because of a shortage of resources. Also, the measures to control the snow goose population were implemented with the thinking that they would be temporary measures, thus requiring future monitoring and evaluation to know when to cease those activities.

Because of the seriousness of the situation, it was felt that we needed to immediately begin to implement methods to reduce the populations. Modelling had shown that we could not exceed the target mortality and that the risk of not acting was greater. In the meantime, scientific work would continue to provide continuous data for evaluation of the methods being implemented. To address our uncertainty about being able to achieve sufficient population reduction, and for possible changes in direction, new international working groups were set up to examine: (1) options for non-lethal population control, (2) control through landscape modification, and (3) methods to cull the populations.

3. How was the government's Integrated Risk Management Framework applied in addressing this issue?

The Framework did not yet exist when the initial science and policy options were being formulated in 1995-1999. However, after comparison of the CWS approach with the 2001 Integrated Risk Management Framework, it appears that the key elements involved in practising integrated risk management were covered. There was a clear assessment of the relative risks of different approaches (i.e., intervening vs. not intervening); the risks were compared and the most acceptable approach selected; actions were implemented and an evaluation plan is underway to measure the effects of the actions; and there is a clearly framed schedule for re-evaluating earlier decisions. CWS did not make these decisions in isolation, but engaged a broad stakeholder community as well as the public in general.

Transparency and Openness

1. Was an existing or representative set of stakeholders selected to comment on the development of policy options? How was this group chosen?

In Quebec, the environmental effects of growing snow goose populations have been more obviously in the public eye. This is because the entire population of *greater* snow geese stages in the St. Lawrence River Valley during the spring and fall migration. The area has become an important destination for birdwatchers and supports a booming tourist industry. At the same time, the farmers in the area have suffered economic losses due to crop damage caused by the migrating geese. In December 1996, the Technical Committee for the Integrated Management of

Greater Snow Geese was established, and since then it has served as the forum for evaluation of policy options. CWS invited an inclusive set of representatives of stakeholders with divergent interests, including farmers and agricultural organizations, hunters, birdwatchers and other conservation groups, and agricultural and wildlife representatives of both governments. Working together for more than five years, the Committee developed an action plan for management of greater snow geese and considered the recommendations made by the Arctic Goose Habitat Working Group. Special conservation measures to control the population growth, including increases to the harvest rate and use of electronic calls and bait under permit, were unanimously accepted, with the proviso that certain rural communities, where birdwatching tourism is very important, would be avoided. The proposed approach was also considered by the Hunting, Fishing and Trapping Co-ordinating Committee, which co-ordinates wildlife conservation activities related to the Aboriginal people of northern Quebec. The regulations were first implemented in the spring of 1999.

A different approach was taken in western Canada, through which the mid-continent *lesser* snow goose population migrates. There the effects of the overabundance of snow geese are limited to remote areas and are not apparent to residents. There was no formation of a stakeholder group per se; instead, bilateral consultations were undertaken with individual groups throughout the winter of 1998. For example, input was solicited from each of three prairie wildlife federations (non-government organizations) through their annual conventions and through the Prairie Habitat Joint Venture Board, the Manitoba Habitat Heritage Corporation Board and the Alberta North American Waterfowl Management Plan Board. Detailed discussions with the Wildlife Advisory Committee of the Saskatchewan Environment and Resource Management Department were undertaken throughout 2000. CWS also consulted with the Board of Directors of the Saskatchewan Association of Rural Municipalities (SARM). After these stakeholders expressed support, Manitoba endorsed the proposal to implement special conservation measures, beginning in the spring of 1999, and Saskatchewan followed in 2001. Similarly, CWS consulted with regional Inuit organizations (Kitikmeot Hunters' and Trappers' Association, Keewatin Wildlife Federation and Qikiqtalluuk Wildlife Board) over a number of years. Based on the support of these organizations, the Nunavut Wildlife Management Board approved the CWS proposal to implement special conservation measures to begin in the spring of 2001.

The involvement of Canadian non-government organizations was also encouraged in an International Stakeholders' Committee assembled by the Wildlife Management Institute for the International Association of Fish and Wildlife Agencies. The Inuvialuit Wildlife Management Board and the Canadian Wildlife Federation sat on the committee. With one exception (the U.S. Humane Society), the committee was unanimous on the need for intervention.

2a. How were the public and stakeholders informed as to the degree and nature of the scientific uncertainty and risks, and the risk management approach(es) utilized?

Stakeholders and the public were informed through the consultation processes described elsewhere in this document. The main message was that the risk of wrongly not acting was high,

but the risk of wrongly acting was much lower. Thus, the details about uncertainties were not emphasized, as they were considered secondary to the primary issue of management matters. There was consensus about the latter and little uncertainty and risk. Overemphasis on scientific uncertainty can erode public support because scientific certainty is such an elusive quality; instead, proceeding on the basis of best available knowledge and building in mechanisms to learn and adapt were recognized as best practice.

2b. How were the public and stakeholders informed as to how science was taken into account in the decision-making and policy formulation process?

See discussions of various fora above.

The key policy options were: (1) whether to intervene and, if so, (2) how best to reduce the population sizes. To reach those not participating directly in stakeholder committees, we drew upon the formalized process developed for annual consultations on hunting regulations. The first description of the issue and possible need for intervention was presented in the *1995 Report on the Status of Migratory Game Birds in Canada*. The issue was further developed in subsequent issues (1996 through 2001) of this annual report, released each November. Specific alternatives were fully described in the annual December *Reports on Proposals for Modifications to the Migratory Birds Regulations* (1997 through 2001). Information was also provided in the July 1998, 1999 and 2000 reports *Migratory Game Bird Hunting Regulations in Canada*. These documents are distributed to approximately 700 federal, provincial and state governments, Aboriginal and non-government organizations, and hunting and conservation groups such as the World Wildlife Fund, Canadian Nature Federation, and Nature Conservancy of Canada. The documents are also posted on the CWS Web site, following a Notice of Intent being published in the *Canada Gazette*.

The federal court's review concluded that the Government of Canada had prepared the special regulations through a "significant, protracted period of development, extensive consultations and opportunity for input."

3. What public consultation was undertaken on the policy options? How have stakeholder views and public concerns been taken into consideration?

Same as above.

Review

1. What tools and mechanisms are in place for monitoring, measuring and reporting on the scientific implications of the policy?

Now that a program for snow goose population reduction is underway, there are continuing important and costly requirements related to evaluation of progress and reassessment of objectives. A review of science needs was prepared by the AGHWG, from which the highest-priority studies are in progress. The needs identified included surveys of population abundance

and distribution, marking programs to evaluate mortality parameters (harvest rates tied to specific colonies), improved estimates of harvest, extensive and intensive surveys of habitat and vegetation communities, and surveys of the effects on other birds and wildlife. However, funding is insufficient to support all the work that should be done to track the scientific implications of the policy implementation – the tradeoff has been to focus on the "indicator" (goose numbers) more than on the "effect" (plant communities). The study results are reported back to the Arctic Goose Joint Venture for continual re-evaluation of population objectives and progress toward those goals. The results are also presented to the public through the annual consultation process and the existing stakeholder groups.

2. What are the provisions for a review of the science and the decisions (based on a set time period or on significant changes in the science or policy)?

Reviews of new contributions to the science background and progress toward the goal, as well as re-evaluation of the goal, take place annually. This schedule is established partly because of the annual requirement to promulgate regulations (Migratory Birds Regulations under the Migratory Birds Conservation Act) allowing special conservation measures for hunters to take birds outside the hunting season. Also, see above for a discussion of how the measures demand an evaluation procedure and process because they are temporary in scope.

APPENDIX 8
TABLE FROM CCMD ROUNDTABLE REPORT

(Creating Common Purpose: The Integration of Science and Policy in Canada's Public Service)

An Overview of Moving from the Present to the Ideal

PRESENT	TRANSITION		IDEAL
Issues at the Interface of Science and Policy	**Cornerstones to Common Purpose and Integration**	**Tools, Strategies and Approaches**	**Benefits**
Conflicting science and public service value systems and differences in conceptual models between the groups. Communication barriers resulting from differences in language and lack of opportunities for dialogue between science and policy. Misunderstanding surrounding the science and policy processes. Difficulties in sustaining team and multidisciplinary work resulting from limitations in science capacity.	Informing about roles and fostering a common purpose for science and policy communities. Organising science/policy work teams around the resolution of key issues. Providing training and development opportunities with exposure to science or policy processes and issues. Recognizing and rewarding science contributions to policy work, and policy contributions to science work.	Review, discuss and publicise roles for science – and policy. Share information in an iterative process between science and policy. Communicate around specific issues in an institutionalised process. Reallocate staff capacity to new teams and research areas using incentives. Promote development such as job shadowing for science and policy positions. Educate scientists about the policy process and issues, and vice versa. Provide opportunities and incentives for work exchanges between science and policy. Interpret research scientist promotion requirements to recognize contributions to policy development. Communicate expectations to science and policy groups.	**For the science community:** Increased credibility Increased recognition Increased trust in policy people Improved morale Increased satisfaction **For the policy community:** Increased trust and understanding of science More proactive policy decisions More timely policy responses More effective, robust solutions **For organizations:** Better workplace atmosphere Increased value for money on science investments Increased relevance of science Better public policy **For the public:** Increased credibility of science Increased confidence in government decision making Increased support of federal science

Science Policy Branch - Environment Canada

Working Paper Series

1 *Environment Canada's Scientific Research Publications in 1995*

2 *Science for Sustainable Development*

3 *Communicating Science at Environment Canada: A Brief Review of Lessons Learned from Communications on Acid Rain and the Depletion of the Stratospheric Ozone Layer*

4 *The Precautionary Principle, Risk-Related Decision Making, and Science Capacity in Federal Science-Based Regulatory Departments: A Discussion Document*

5 *Strengthening Environmental Research in Canada: A Discussion Paper*

6 *Environment Canada's Scientific Research Publications 1980-1997*

7 *Research & Development and Related Science Activities at Environment Canada*

8 *Measuring The Impacts Of Environment Canada's R&D: A Case Study of Pulp & Paper Effluent Research*

9 *Measuring The Impacts Of Environment Canada's R&D: A Case Study of Stratospheric Ozone Depletion Research*

10 *Measuring The Impacts Of Environment Canada's R&D: Notes On Methodology*

11 *Science Advice in Environment Canada*

12 *Environment Canada University Research Partnership Expansion Strategy: A Discussion Paper*

13 *Environment Canada's S&T: Expenditures & Human Resources, 1990-1999*

14 *National Environmental R&D Agenda-Setting: A Commentary on Issues, Options, and Constraints*

15 *Science in the Public Interest: Values and Ethics in the Management, Use and Conduct of Science at Environment Canada*