Science Advice
for Government Effectiveness
(SAGE)

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Council of Science and Technology Advisors

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Science Advice for Government Effectiveness[1]

Background

The Council of Science and Technology Advisors (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. Recent government decisions in the areas of natural resources management (e.g., fish stocks) and public health and safety (e.g., the blood supply) have contributed to public concern regarding the ability of government to effectively address science-based issues. The CCEU recognizes the importance of these concerns and has asked the CSTA, as one of its initial tasks, to develop a set of principles and guidelines for the effective use of science advice in making policy and regulatory decisions. It is hoped that more effective use of science advice will reduce science-related crises of public confidence. In addition, science advice will play an important role in positioning the Canadian government to take advantage of the opportunities presented by advances in science and technology (e.g., the information highway). Capitalizing on these opportunities contributes to innovation, economic growth, public health and safety, and environmental protection.

Canada is not alone. Other countries are grappling with similar challenges and opportunities and are engaging in similar efforts to improve their science advisory processes. The adoption of Canadian science advice principles and guidelines will not only improve the government's ability to deal with science-based issues domestically, but will also ensure that Canada is well-positioned to lead any effort to develop international standards for science advice.

This report provides guidance on how to ensure that government decisions are informed by sound science advice. The report presents a set of six key science advice principles which can improve science-based decision making, and a series of concrete guidelines to facilitate the adoption of the principles espoused. Finally, the report presents options for how the government could implement the principles and guidelines, ensure their adherence by individual departments, and monitor their effectiveness.

In this report "science" is defined broadly to include the natural, health, and social sciences, mathematics, engineering, and technology. "Science advice" is defined as value-added guidance deriving from scientific theories, data, findings, and conclusions provided to inform policy and regulatory decision making.

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[1] This work draws heavily from the work of Sir Robert May (UK), David Beckler (US), Willie Smith (NZ) and others.

While the individual principles and guidelines espoused are consistent with many of the current practices in Canada and elsewhere, a clearly defined set of government-wide principles and guidelines for science advice is new to the Canadian federal government. Of the countries studied, only the UK has established formal government-wide science advice principles and guidelines. These were implemented within the last two years; too recently to provide a thorough evaluation of their effectiveness at this time.

Context

The emergence of the knowledge-based society has underscored the importance of sound science advice as a key input to policy formulation both nationally and internationally. The pervasiveness of science and technology is such that they now impact most core government functions. The issues facing governments are increasingly complex and require decisions that have profound impacts on societies and economies. Many of these decisions involve risk assessments that arouse public concerns about their health, safety and long term well-being; others attempt to capitalize on the opportunities afforded by advancements in science and technology.

As we enter the 21st century, government decision making is also taking place in a highly dynamic environment. Government decisions taken in a federal context may involve federal-provincial considerations. Policies and decisions often need to take into account the diverse physical and social considerations that exist in Canada. In addition, there are increasing concerns regarding the accountability and liability of scientists and decision makers. Fuelled by increased access to information, there is heightened public interest in science-based issues and greater emphasis on active public involvement in decision making. At the same time, there is greater public scepticism of science, government, industry, and the interactions among them. Greater science literacy and better communication of scientific uncertainty will increase the public's understanding of the capabilities and limitations of science.

This report addresses science advice. Clearly, decision making in government must consider a wide range of inputs and consult, as appropriate, advisors competent in other aspects of public policy (e.g., economics, public administration, social science, international affairs, etc.). Decision makers must exercise their legitimate role to weigh these multiple inputs and make choices. Science advice has an important role to play by contributing to government decisions which serve Canada's strategic interests and concerns in areas such as public health and safety, environmental protection, resource exploitation, wealth creation, innovation, and national security.

Desirable Outcomes

The Federal Government requires an effective science advisory process that leads to better government decisions, minimizes crises and unnecessary controversies, and capitalizes on opportunities. An effective advisory process brings sound science and the best science advice to bear on policy issues and ensures that:

- Ministers are confident that a rigorous and objective assessment of all available information was made in providing the advice;
- the public and parliamentarians are confident that government is using science in the best interests of Canadians, and that science advice provided to decision makers is credible; and,
- Canada has an enhanced ability to influence international solutions to global problems.

Principles and Guidelines

The science advice principles and guidelines that follow reflect the evolving context for government decision making. Their adoption will lead to the desirable outcomes identified above. When implemented these guidelines should remain largely consistent across government departments with only a small number of exceptions. Departments should justify any changes needed to tailor them to individual departmental situations.

I. Early Identification

Decision makers need to be convinced of the importance of seeking science advice and recognize when science advice is needed. Departments need to anticipate, as early as possible, those issues (representing both challenges and opportunities) for which science advice will be required. A broad base of advice can lead to improvements in the timeliness of issue identification. Interdisciplinary, interdepartmental, and international cooperation should be in place to identify, frame, and address 'horizontal' issues.

Guidelines

- Decision makers need to cast a wide net (consulting internal, external[2], and international sources) to assist in the identification of issues requiring science advice.
- Decision makers need to communicate to scientists those policy areas requiring advice, and government scientists need to be able to recognize the connections between their research and potential policy issues.

[2] External sources include, for example, other government departments, provincial governments, academe, industry, professional societies, and other interested parties.

- Departments need a sufficient and adaptable internal capacity to identify science issues and to assess, translate and communicate science for policy.
- Departments need to support and encourage their science and policy staffs to establish linkages with each other and with external and international sources.
- Departments need to maximize the use of expertise across government departments to identify and address 'horizontal' issues.

II. Inclusiveness

Advice should be drawn from a variety of scientific sources and from experts in many disciplines in order to capture the full diversity of scientific schools of thought and opinion. Inclusiveness enhances the debate and draws in scientific findings which may not otherwise be considered; sound science thrives on the competition of ideas facilitated by the open publication of data and analyses. The market for science advice is global and the growing body of science knowledge available internationally must be brought to bear on policy issues. Inclusiveness aids in achieving sound science advice by reducing the impact of conflicts of interest or biases that exist among advisors.

Guidelines

- Science input and advice needs to be sought from a wide range of sources; due weight needs to be given to the 'traditional knowledge' of local peoples; decision makers need to balance the multiple viewpoints received.
- While advice from external and international sources needs to be sought regularly, it is especially important to seek such advice in the following situations. Government also needs to consider engaging external, independent agencies to create advisory panels or to solicit advice in these circumstances:
  - the problem raises scientific questions that exceed the expertise of the in-house staff;
  - the issue is 'horizontal' or cuts across lines of jurisdiction within or among departments;
  - there is significant scientific uncertainty;
  - there is a range of scientific opinion; or,
  - there are potentially significant implications for sensitive areas of public policy and where independent scientific analyses can strengthen public confidence.
- Decision makers need to be open to both solicited and unsolicited advice from external sources.

III. Sound Science and Science Advice

The public expects government to employ measures to ensure the quality, integrity, and objectivity of the science and the science advice it utilizes, and to ensure that science advice is considered seriously in decision making. Due diligence procedures for assuring quality and reliability, including scientific peer review, need to be built into the science advisory process. Where information is proprietary, external peer review needs to proceed with appropriate measures to maintain confidentiality. Science advisors need to contribute sound scientific information, unfiltered by other policy considerations. In developing policy, departments need to involve advisors in assessing the implications of various policy options.

Guidelines

- All advisory processes, including those involving traditional knowledge, need to be subject to due diligence. This should include rigorous internal and external review and assessment of all input, analyses, findings, and recommendations of advisors. The fact that information is proprietary should not preclude external review, although confidentiality of such information should be appropriately maintained.
- Science advice needs to be supported by research and policy analysis:
  - Decision makers need to ensure there are sufficient resources for supporting policy research and analysis to underpin the science advisory process.
  - Scientists need to have the flexibility to explore the range of conclusions and interpretations that the scientific findings might suggest.
  - A strong coupling needs to exist between the science advisors and the departmental policy and analytical support mechanisms.
  - Science advisors need to assist decision makers and science managers set research priorities and design an R&D base that will support future science-based decision making.
- Selection of advisors needs to:
  - be matched to the nature of the issue and the breadth of judgement required;
  - be balanced to reflect the diversity of opinions and to counter potential biases;
  - include at least some experts from other, not necessarily scientific, disciplines; and,
  - be regularly rotated, with replacements chosen to preserve balance of representation.
- Advice providers need to:
  - adhere to professional practice and conflict of interest guidelines;
  - clearly distinguish scientific fact and judgement from their personal views in formulating their advice; and
  - recognize the limits of science advice and the existence of other considerations in decision making.

- Departments need to:
  - ensure in-house expertise to assess and communicate science (whether generated internally or externally) to decision makers;
  - promote professional practices for those involved in the conduct, management and use of science[3];
  - provide and enforce conflict of interest guidelines. Considerations include:
    - advisors need to be required to declare any conflicts of interest prior to serving in an advisory capacity and to update such declarations throughout their term of service;
    - while the responsibility for documenting and avoiding conflicts of interest should be placed on the advisor, decision makers need to have the ultimate responsibility for protecting against actual or perceived conflicts of interests.
  - clearly document the science advice received and report back to the advice providers how decisions are made.
- Decision makers need to:
  - take care to separate scientific fact and judgement from personal views and judgements in formulating the questions to be addressed;
  - be conscious of possible biases in the advice providers and be alert to indications of bias in the advice received; and
  - involve science advisors in policy formulation, to help maintain the integrity of the advice throughout the decision making process.

IV. Uncertainty and Risk

Science in public policy always contains some uncertainty and often a high degree of uncertainty which must be assessed, communicated, and managed. As such, it is important to consider adopting a risk management approach. In addition to hazards, uncertainty may include potential benefits or opportunities which should not be ignored. The goal of risk management is scientifically sound, cost-effective, integrated actions that reduce risks while taking into account social, cultural, ethical, political, and legal considerations.

[3] The report of the Best Practices Initiative, a joint effort led by Health Canada and the four natural resources related departments (NRCan, EC, AAFC, and DFO) on behalf of the ADMs Ad Hoc Committee on Science in Government, provides useful guidance in this regard. It presents a set of fundamental values, traits of key stakeholders, and best practices to ensure that federal government science is conducted credibly, managed effectively, and used wisely. Best practices are identified in the areas of organizational environment, accountability, science in decision making, review processes, and communications.

Guidelines

- Departments require a clearly defined set of risk management guidelines, including how and when the precautionary principle[4] should be applied, in order to maintain confidence that a consistent and effective approach is being used across government.
- Science advisors need to ensure that scientific uncertainty is weighted fairly, is explicitly and fully identified in scientific results, and is communicated directly in plain language to decision makers; decision makers need to ensure that scientific uncertainty is given appropriate weight in policy decisions.
- Science advisors and decision makers need to communicate to the public and stakeholders the degree and nature of scientific uncertainty and the risk management approach utilized in reaching decisions.

V. Openness

Democratic governments are expected to employ decision making processes that are transparent and open to stakeholders. Openness implies a clear articulation of how decisions are reached, policies are presented in open fora, and the public has access to the findings and advice of scientists as early as possible. It is essential that the public be aware of what the responsibility of government is in relation to the use of science. In addition, decision makers need to treat the science advisory function as an integral part of the management process. Effective relationships between decision makers and science advisors benefit from an understanding of their differing perspectives and approaches. Policy makers and advice providers need to communicate to ensure that policy makers are convinced the science advice is current and sound. In turn, advice providers need to be confident that their advice is considered seriously in decision making. Finally, there needs to be consultation with stakeholder groups and public discourse to ensure that public values are considered in formulating policy. Early and ongoing consultation both within government and with the public can mitigate greater negative debate and controversy when policies are announced.

Guidelines

- Decision makers need to provide early warning of significant policy and regulatory initiatives to key interest groups, other governments or international organizations, as appropriate.
- Departments need to allow scientists freedom to pursue a broad base of inquiry and undertake widespread and thoughtful discussions. Departments need to make every effort to support and encourage scientists to publish their research findings and conclusions in external peer-reviewed publications. However, inevitably, circumstances will arise where the findings and conclusions will conflict with existing government

[4] The 'precautionary principle' dictates that action to reduce risk should not await scientific certainty.

policies. In these cases, departments need to review both the policies and all of the relevant scientific findings and advice in order to determine how to proceed.

- Departments need to publish and disseminate widely all scientific evidence and analysis (other than proprietary information) underlying policy decisions, and show how the science was taken into account in policy formulation.
- Decision makers need to explain how the advice they received was used and why the ultimate decision was made.
- Departments need to consider using public meetings to present policy; scientists need to have a leading role in explaining their advice and policy officials need to describe how the advice was secured and how the policies have been framed in light of the advice.
- The level of expected risk and controversy and the need for timely decisions should guide the nature and extent of consultation undertaken, with higher levels of risk and controversy demanding a greater degree of public consultation. Decision makers need to balance the need for timeliness in reaching decisions with the need for effective consultation.

VI. Review

The principle of review includes two elements: 1) subsequent review of science-based decisions to determine whether recent advances in knowledge impact the science and science advice used to inform the decision, and 2) evaluation of the decision making process. Appropriate accountability mechanisms need to be in place to ensure that these principles and guidelines for sound science advice are followed.

Guidelines

- Departments need to institutionalize a follow-up process that includes, once decisions have been made, the provision of written responses to the findings and recommendations that emerged during the advisory process.
- Policy decisions need to be reviewed subsequently to determine whether recent advances in knowledge impact the science and science advice used to inform the decision. The period for review will depend on the state of the science (e.g., the level of uncertainty, rate of change in the scientific knowledge) and a maximum period before review should be identified at the time the decision is taken (e.g., establish a “best before” date).
- When asked to review past decisions, advisors should have access to all relevant information including previous analyses and official responses.
- Departments should capture best practices that emerge from the advisory process and feed these into their guidelines for use of science advice in the future.

Implementation

Implementing the principles and guidelines will help build public confidence in government decision making. Adherence to the principles and guidelines will also lead to better understanding of the contribution of science to departmental and government-wide missions and mandates.[5] A strategy for implementing the science advice principles and guidelines must include three elements: 1) promoting their adoption, 2) ensuring their adherence by individual departments and across government, and 3) monitoring their effectiveness. The following options are provided for consideration as part of an implementation strategy.

Promoting the Adoption of Science Advice Principles and Guidelines

- Identify the people who can assist departments adopt the principles and guidelines.
- Provide professional development/training to government decision makers and scientists to improve science communication and the use of science advice in policy making.
- Make all government departments, not just the science-based departments and agencies (SBDAs), aware of the principles and guidelines and encourage their use when dealing with science laden issues.
- Communicate the existence of the principles and guidelines to stakeholders and the public, and publicise cases that illustrate best practice in the use of science advice.
- Consider creating a Parliamentary Committee tasked with the examination of science and technology issues. One of its functions could be oversight of the use of science advice in government decision making.

Ensuring Adherence and Accountability

- Provide a template or simple checklist to assist decision makers ensure they have adhered to the principles and guidelines.
- Require annexes to Cabinet documents and legislation that demonstrate adherence to the principles and guidelines and recommend science review procedures.

[5] CSTA recognizes that implementing these principles and guidelines will make demands on the government's science-based departments. The government's capacity to undertake science required to inform decision making will be examined as part of CSTA's broader examination of the roles of the federal government as a performer of S&T and its capacity to deliver on those roles.

- Designate a "departmental champion" within each science-based department (perhaps the Science ADM) responsible for:
  - Guiding the implementation of the science advice principles and guidelines and ensuring the department's adherence;
  - Preparing an annual report of the department's measures which demonstrate adherence to the principles and guidelines; and
  - Sharing best practices with their counterparts in other SBDAs.

- Departments establish, through their Deputy Ministers, a mechanism to ensure that science advice is received and acted upon in a timely fashion in reaching government decisions.

- Identify a government-wide coordination and accountability mechanism (possibilities include the Committee of Senior Officials (COSO) S&T Committee, the Ethics Counsellor, etc.) responsible for:
  - "Championing" the principles and guidelines government-wide;
  - Ensuring the application of the principles and guidelines to 'horizontal' issues;
  - Receiving the departmental annual reports and preparing a government-wide annual report on science advice (perhaps included as an annex to the Annual S&T Report);

Monitoring Effectiveness

- Assess the application of the principles and guidelines through:
  - Audit mechanisms;
  - Reports to a designated "oversight function" such as a parliamentary committee (e.g., the proposed new Science and Technology Committee or the Natural Resources and Government Operations Committee) or the Auditor General;

- Measure the success of the government science advice principles and guidelines through review by an external advisory body (such as departmental science advisory committees and CSTA).

Conclusion

The principles and guidelines contained in this report address how science advice should be sought and applied, but CSTA recognizes that the government must establish policies and make decisions when certainty does not exist and, at times, under extreme time constraints. The principles and guidelines espoused should not inhibit action, but rather guide action.

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