



Canadian Centre for
Management Development

Centre canadien
de gestion

FOR ALL THOSE WHO BELIEVE IN EXCELLENCE • POUR CEUX ET CELLES QUI CROIENT EN L'EXCELLENCE

A FOUNDATION FOR DEVELOPING RISK MANAGEMENT LEARNING STRATEGIES IN THE PUBLIC SERVICE



RISK MANAGEMENT

CCMD ROUNDTABLE
ON RISK
MANAGEMENT

CHAired BY
IAN SHUGART

BY STEPHEN HILL &
GEOFF DINSDALE

Action – Research
Roundtables

Canada



Canadian Centre for
Management Development

Centre canadien
de gestion

FOR ALL THOSE WHO BELIEVE IN EXCELLENCE • POUR CEUX ET CELLES QUI CROIENT EN L'EXCELLENCE

A FOUNDATION FOR DEVELOPING RISK MANAGEMENT LEARNING STRATEGIES IN THE PUBLIC SERVICE



ACTION – RESEARCH
ROUNDTABLES

RISK MANAGEMENT

CCMD ROUNDTABLE
ON RISK
MANAGEMENT

CHAired BY
IAN SHUGART

BY STEPHEN HILL &
GEOFF DINSDALE

Canada

For more information or copies,
please contact the Strategic Research and Planning Group of the
Canadian Centre for Management Development

Phone: (613) 947-3682
Fax: (613) 995-0286

The opinions expressed are those of the authors
and do not necessarily reflect the views of the
Canadian Centre for Management Development

© Canadian Centre for Management Development

National Library of Canada cataloguing in publication data

Hill, Stephen, 1969-

A foundation for developing risk Management learning strategies
in the Public Service

Text in English and French on inverted pages.

Title on added t.p.: Fondements en vue de l'élaboration de stratégies
d'apprentissage en gestion du risque dans la fonction publique.

"CCMD Action-Research Roundtable on Risk Management, chaired
by Ian Shugart."

Includes bibliographical references.

ISBN 0-662-65523-0

Cat. No. SC94-77/2001

1. Risk management -- Canada.
2. Civil service -- Canada -- Management.
 - I. Dinsdale, Geoff.
 - II. Shugart, Ian.
 - III. Canadian Centre for Management Development.
 - IV. Title.
 - V. Title: Fondements en vue de l'élaboration de stratégies
d'apprentissage en gestion du risque dans la fonction publique.

HD61.H54 2001 658.15'5 C2001-980070-3E

A WORD FROM CCMD

The Public Service of Canada is evolving at an ever-quickening pace and research is needed to address the issues and challenges public servants face daily. In consultation with managers, CCMD identified four issues of immediate and critical concern and launched four Action-Research Roundtables:

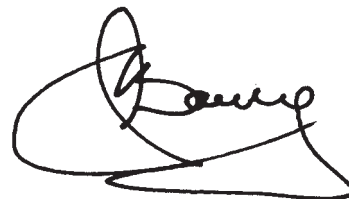
- Implementation of the Social Union Framework Agreement (SUFA)
- Building the learning organization
- Managing horizontal issues
- Risk management

This report has been released by the Action-Research Roundtable on Risk Management. Its objectives included reviewing various initiatives and studies undertaken to date, identifying guiding principles and good practices and, ultimately, advancing thought and practice in the field. I am pleased to report that these objectives have been met.

Overall, this report on learning strategies provides a powerful complement to existing initiatives on risk management within the Public Service. It will help equip public servants to manage risk more effectively. The Roundtable has also released a primer on risk management and a paper on trust and risk management, both of which are available on CCMD's Web site at www.ccmd-ccg.gc.ca

I would like to thank the Chair of this Roundtable, Mr. Ian Shugart, Assistant Deputy Minister, Health Canada. The knowledge he brought to this project and his committed leadership throughout the Roundtable's journey proved to be key to the success of this project. I would also like to thank the Roundtable members for their valuable contribution. And finally, recognition should go to Geoff Dinsdale, coordinator of the Roundtables, as well as Stephen Hill and Valérie Baillard, members of the Roundtable secretariat, for their support throughout this project.

Jocelyne Bourgon

A handwritten signature in black ink, appearing to read 'J Bourgon', with a large, stylized flourish underneath.

President,
Canadian Centre for
Management Development

CCMD ROUNDTABLE ON RISK MANAGEMENT

Chair: Ian Shugart, Health Canada

Members:

Mr. Jean Bélanger	National Roundtable on the Environment and the Economy
Gary Breen	Private Consultant
Jean Chartier	Canadian Food Inspection Agency
Marie-France D'Auray-Boult	Treasury Board of Canada Secretariat
Ruth Dantzer	Privy Council Office
Hélène Denis	University of Montreal
Bruce Doern	Carleton University
Bill Doubleday	Canadian Centre for Management Development
Liseanne Forand	Fisheries and Oceans Canada
Jonathan T. Fried	Finance Canada (formerly with Foreign Affairs and International Trade)
Richard Isnor	Environment Canada
Pam G. Pitz	Royal Bank
William T. Stanbury	University of British Columbia

Secretariat: Geoff Dinsdale, Canadian Centre for Management Development
Stephen Hill, University of Calgary
Valérie Baillard, Public Works and Government Services Canada

PREFACE

The intent of this document is to provide a foundation for developing learning strategies and curriculum for public sector risk management. Effective risk management is critically important for the public service; the ability to make good decisions about policies, programs and services in an environment of uncertainty is paramount. With increasing frequency, the public service is facing difficult decisions about health and environmental risks, risks to economic well-being, technology risks, and risks in service delivery, among many others. The government's responsibility and duty of care to the public requires that the practices and lessons of good risk management be followed. This document does not provide the specific content for a course on risk management, which should necessarily be context specific. Rather, it attempts to set broad curriculum goals that will provide the foundation for course and training development both by CCMD and within specific departments. The Risk Management Roundtable members believe that future curriculum and training programs within the public service should, at the very least, address the issues raised within this document.

The ideas in this document complement risk management work by other federal agencies. Work by two groups has been particularly important: a Privy Council Office-initiated Working Group of Assistant Deputy Ministers on Risk Management (*Risk Management for Canada and Canadians: Report of the ADM Working Group on Risk Management*, available online at www.pco-bcp.gc.ca/public_e.htm); and the Treasury Board Secretariat *Integrated Risk Management Framework*. Attempts have also been made to align the document with other federal risk management initiatives, such as the work being led by the Privy Council Office to develop guiding principles for the precautionary approach. The Department of Justice is also leading work on legal risk management and the Treasury Board Secretariat is undertaking work on financial risk management, program integrity, and information technology risks. In addition, to support the *Integrated Risk Management Framework*, the Treasury Board Secretariat is conducting a risk management needs analysis (e.g., taking stock of courses and tools across the public service). As part of the overall federal strategy for improving public service risk management, CCMD has undertaken the task of exploring the learning requirements for building risk management competencies and systems for public service managers. Figure 1 shows the different federal groups working on risk management issues.

This document is a product of the Canadian Centre for Management Development's Action-Research Roundtable on Risk Management. These Roundtables bring together practitioners, academics, and experts to discuss management issues of immediate and critical importance. This approach facilitates applied research and exploration of contemporary public service issues.

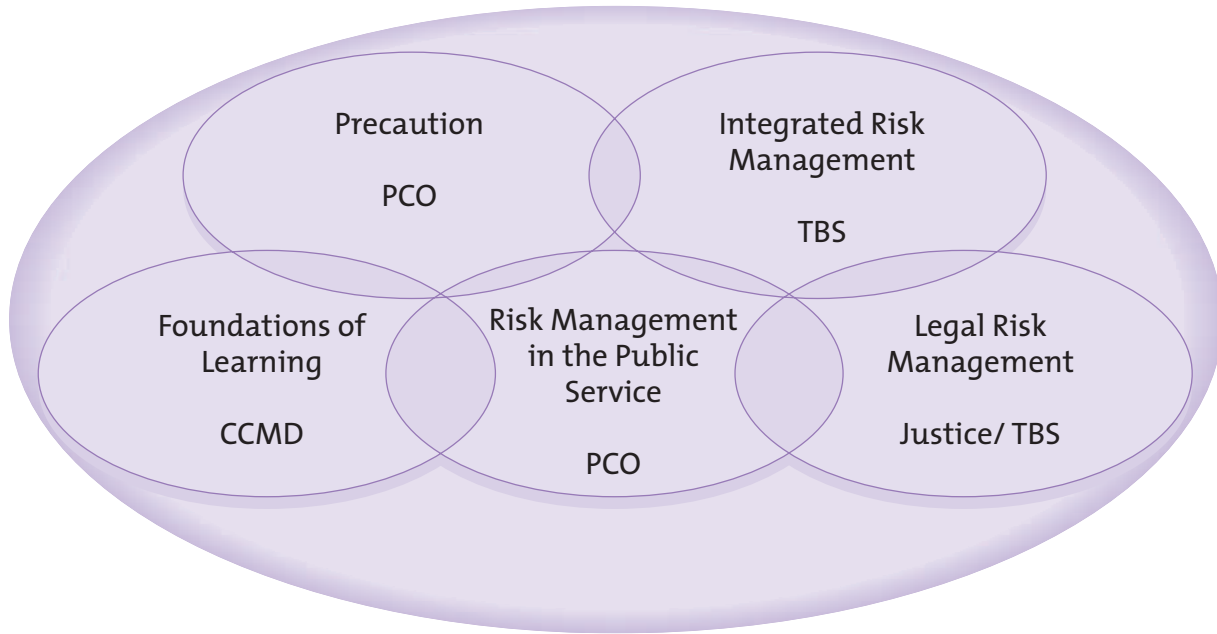


Figure 1. Showing some of the risk-management related activities of the federal government.

The document is a synthesis of the Roundtable’s thinking on public sector risk management. While Roundtable members agree in principle with the broad content of the paper and have reviewed a number of drafts of this document, the authors remain responsible for the details and specific content. Because of the interdisciplinary nature of risk management, a conscious attempt has been made to use language that is accessible to the broadest possible audience. This effort is important because good risk management requires horizontal and interdisciplinary work. It also requires action from all levels of the public service: from the direction set by the most senior managers to the ongoing assessment of risk by policy and risk analysts. It is our hope that this document will serve as a first step on a longer journey of personal and organizational awareness in risk management.

The Roundtable members faced a significant challenge in drawing boundaries around their work and the content of this document. Our discussions offered any number of trails we could have pursued in exploring new dimensions of risk management in the public sector. In the end, we decided to focus on the immense cultural challenges of building organizations that make sound, public-interested decisions in the midst of uncertainty. One important aspect of this goal is the matter of earning and retaining the public trust. A companion piece produced by the Roundtable addresses this issue.

We appreciate very much the opportunity to contribute to this important issue through the Roundtable process. Each member offered invaluable experience and perspective, and I thank them all.

Ian Shugart

Chair, CCMD’s Action-Research Roundtable

On Risk Management

ACKNOWLEDGEMENTS

First and foremost, thanks must be given to the members of the Risk Management Roundtable for their efforts. Roundtable members happily volunteered time from their busy schedules for meetings, document reviews, independent research, and to have their day broken up with last-minute telephone calls and questions. It is only through the wisdom and generosity of these individuals, who recognized the importance of this issue, that this work was completed.

The authors also owe thanks to Peter Stoyko of Carleton University, who provided insight at a critical juncture in the writing of the document. His efforts improved the document significantly. The authors especially thank their colleague Valérie Baillard for her support.

Finally, the authors would like to thank the numerous individuals who reviewed draft versions of this document, provided feedback along the way, and assisted in the production of this document — particularly Marc Villemaire, Suzanne Ryan, H el ene Quesnel, Michael Picciano, Alan Starcher and Victor Bradley.

TABLE OF CONTENTS

1 PART I -- THE ESSENTIALS OF RISK MANAGEMENT

1. INTRODUCTION	3
1.1. HOW WELL IS YOUR ORGANIZATION MANAGING RISK?	4
1.2. WHAT IS RISK MANAGEMENT?	4
1.3. WHAT IS RISK?	5
1.4. HOW CAN RISKS BE "MANAGED"?	5
2. WHY DOES RISK MANAGEMENT MATTER?	6
2.1. IT HELPS TO AVOID UNWANTED EVENTS	6
2.2. IT PROVIDES NEW OPPORTUNITIES FOR INNOVATION	6

2 PART II -- THE RISK MANAGEMENT PROCESS: A LEARNING LOOP

3. UNDERSTANDING RISKS	8
3.1. IDENTIFYING ISSUES, SETTING CONTEXT	8
3.2. ASSESSING KEY RISK AREAS	9
3.2.1. Empirical risk characterization	9
3.2.2. Intuitive risk characterization	9
4. DEVELOPING A RISK MANAGEMENT STRATEGY	10
4.1. SETTING OBJECTIVES	10
4.2. DEVELOPING OPTIONS	10
4.2.1. Determining what constitutes an adequate degree of precaution	10
5. IMPLEMENTING A RISK MANAGEMENT STRATEGY	10
6. ACQUIRING FEEDBACK FOR LEARNING	11
6.1. EVALUATION, MONITORING AND REPORTING	11
6.1.1. Developing indicators based on objectives	11
6.1.2. Developing indicators based on process	11
6.2. USING EVALUATION RESULTS TO IMPROVE FUTURE RISK MANAGEMENT	11

3 PART III -- FOUNDATIONS OF RISK MANAGEMENT LEARNING STRATEGIES: PEOPLE AND PROCESS

7. THE PEOPLE WHO MANAGE RISKS	13
7.1. KNOWLEDGE	14
7.1.1. Knowledge of fundamental concepts in risk management	14
7.1.2. Knowledge of the situations that create risks	14
7.1.3. Understanding how trust is lost, built and maintained	14
7.2. COMPETENCIES	15
7.2.1. Risk communication and stakeholder involvement	15
7.2.2. Systems thinking	17
7.2.3. Scenario planning	17
7.2.4. Interdisciplinary teamwork	18
7.3. CULTURE, VALUES AND BELIEFS	19
7.3.1. Exploratory learning, experimentation and adaptive management	19
7.3.2. Tolerance for mistakes	20
7.3.3. Proactive attitudes toward risk	20

1

2

3

4

8.	THE RISK MANAGEMENT PROCESS	20
8.1.	STRUCTURES, SYSTEMS AND STRATEGIES	20
8.1.1.	Establish clear accountability and responsibility for risk decisions	20
8.1.2.	Get the incentives right	21
8.1.3.	Make the risk decision-making process explicit	21
8.1.4.	Improve inter-departmental and interdisciplinary coordination	21
8.1.5.	Clarify the role of precaution in risk management	23
8.1.6.	Clarify the role of experts and science in risk decision making	23
8.1.7.	Monitor implementation and adjust direction	24
8.1.8.	Develop control systems to set the parameters of risk taking	24
9.	HIGHLIGHTS OF A LEARNING FOUNDATION	25
10.	BARRIERS AND BRIDGES TO GOOD RISK MANAGEMENT	26
11.	CONCLUSIONS AND RECOMMENDATIONS	28
11.1.	POSTSCRIPT: THE WAY AHEAD	29
12.	ADDITIONAL TEACHING AND LEARNING RESOURCES	30
12.1.	FEDERAL GOVERNMENT	30
12.1.1.	Privy Council Office: Assistant Deputy Minister Working Group on Risk Management	30
12.1.2.	Treasury Board Secretariat	31
12.2.	CONFERENCE BOARD OF CANADA	31
12.3.	CANADIAN STANDARDS ASSOCIATION	31
12.4.	CANADIAN INSTITUTE OF CHARTERED ACCOUNTANTS	31
12.5.	ONLINE	32
12.6.	ACADEMIC	32
12.6.1.	Centres, Institutes and Chairs Related to Risk Management	32
12.6.2.	Some Important Journals	32
4	REFERENCES	33
	APPENDIX A: RISK MANAGEMENT FRAMEWORKS	34
	APPENDIX B: TWO SAMPLE RISK IDENTIFICATION LISTS	36
	APPENDIX C: PRECAUTIONARY APPROACH DEFINITION	38
	APPENDIX D: SOME FACTORS AFFECTING THE PERCEPTION OF RISK	39

1. Introduction

What is it that makes people climb Mount Everest? Why have Europeans largely rejected genetically modified foods while they remain less contentious with North Americans? Why is the world finding it difficult to reduce greenhouse gas emissions in the face of possibly serious climatic change? Why are people more afraid of flying than driving even though the risk of accident in a car is much higher than in a plane? There are no simple answers to these questions, but they all have one thing in common — risk. Risk is a function of both the empirical characterization of risk — usually defined as the product of the probability and magnitude of some event occurring — and the cultural, social, and political contexts that shape people’s response and perceptions to uncertain events. Because the public service plays a leading role in risk decisions, it is paramount for public servants to have the ability to effectively manage risks.

The first two parts of this paper provide an overview of risk management concepts; these sections are intentionally brief, as similar material has been presented in other recent federal government writing (see especially PCO 2000 and TBS 2001). The third section of this paper attempts to develop the learning requirements for effective risk management in the public service. This is accomplished by analyzing two dimensions of risk management:

- The process dimension — the systems, strategies and structures that make up the risk management cycle. Risk management is a systematic process for making decisions and solving problems — it is not ad hoc. Effective risk management involves a rational approach to making decisions with the logic that a sound process will deliver better decisions over time. The process of managing risk should be conceived of as a loop through which continual learning and improvement occur.
- The people dimension — the knowledge, competencies, culture, beliefs and values necessary for public servants to effectively manage risks. Indeed, it is people that drive the risk management process, and it is people that must work successfully within it. This dimension includes elements such as communications skills, systems thinking, cultures that support individual and organizational learning, and an understanding of the role of science in creating public policy.

From an analysis of these two dimensions, the foundations of a public service risk management curriculum have been derived and are recommended herein.

Most of the learning components within the document apply to public service-wide management issues and concerns. The intended audience for the document is managers of risk.¹ However, the emphasis for certain elements may vary with level and type of responsibility, such as senior executive, manager, and risk analyst. It is important for each person to understand his or her role in the risk management process. The document also makes no attempt to provide direction regarding the specific skills and competencies for various disciplines of risk analysis. For example, we do not suggest how a technical health-risk assessment should be conducted nor do we suggest the skills that a person or team completing such an assessment might require. Although these skills are obviously important, the Roundtable attempted to develop recommendations that cut across departmental lines and apply to the entire public service.

It is important for each person to understand his or her role in the risk management process. The document also makes no attempt to provide direction regarding the specific skills and competencies for various disciplines of risk analysis. For example, we do not suggest how a technical health-risk assessment should be conducted nor do we suggest the skills that a person or team completing such an assessment might require. Although these skills are obviously important, the Roundtable attempted to develop recommendations that cut across departmental lines and apply to the entire public service.

“The government’s ability to manage risk rests on the skills of its people.”

(Privy Council Office 2000)

¹ Please note, when this document refers to “managers of risk” or “risk managers,” it is not referring to a specific position or title within the Public Service, but more generally to any manager engaged in the practice of “risk management” as the term is defined within this document.

1.1. How well is your organization managing risk?

An examination of the following questions will provide a reasonable indication of how well your organization is doing in managing risk.

1. What are the key risks for your organization? Are you tracking emerging risks in order to minimize the potential that they may blindside your organization?
2. Do you and your colleagues understand the fundamental concepts of risk management, and why risk management is important? Do your colleagues understand their role in the overall risk management process?
3. Are you and your colleagues managing risks in a systematic and conscious way, or is it being done ad hoc and intuitively?
4. Does your organization have a strategy for creating effective communication and dialogue around risk issues? Do your stakeholders trust your organization?
5. Do you and your colleagues have the necessary competencies to manage risks effectively? Does your group have a learning strategy for risk management?
6. Are you creating a culture conducive to innovation and effective risk management; and do you know what such a culture entails?
7. Have you discussed the top risks in your management committee or in an executive risk management committee?
8. Have you taken action to reduce the consequences or the likelihood of the top risks and do you have contingency plans to deal with them?
9. Have you informed affected stakeholders about these risks and your strategy to address them?

1.2. What is risk management?

The Assistant Deputy Minister Working Group on Risk Management refers to risk management broadly as "the process for dealing with uncertainty within a public policy environment" (PCO 2000). Building on this, the Treasury Board Secretariat has described risk management as "a systematic approach to setting the best course of action under uncertainty by identifying, understanding, acting on and communicating risk issues" (TBS 2001).

Government deals with risk through various roles, for example as protector of rights, in creating the conditions for economic prosperity, in maintaining environmental integrity, in improving human health, and through the delivery of government services. The intent of risk management is to increase the benefits and decrease the costs of activities with uncertain outcomes. In almost every case, risk management requires decision makers to balance competing interests in their attempt to find an optimal and acceptable solution. Such solutions to risk management problems entail the following types of policy choices: identify and warn people to modify their behaviour; reduce risks through regulation (or other instruments); or compensate persons impacted negatively by a risk event.

1.3. What is risk?

The Treasury Board Secretariat has defined risk as "the uncertainty that surrounds future events and outcomes. It is the expression of the likelihood and impact of an event with the potential to influence an organization's achievement of objectives" (TBS 2001). Risk in this sense is the probability that a future event — either good or bad — will occur. However, the negative aspect of risk (e.g., being killed, losing money, being embarrassed) is most often prominent, and the Privy Council Office definition reflects this reality: risk is "a function of the probability (chance, likelihood) of an adverse or unwanted event, and the severity or magnitude of the consequences of that event" (PCO 2000).

According to Slovic, "There is no such thing as real risk or objective risk" (1992, 119). He implies that risk is not something waiting to be measured independent of our minds, cultures, politics and worldviews — it is inherently subjective. For instance, a scientist's probabilistic risk estimate, while stemming from scientific theory and evidence, may include professional judgment about the relative importance of different outcomes, the acceptability of uncertainty, and so on. The layperson's risk estimate, while less systematic than a scientist's, is intuitively sophisticated and may reflect important considerations that differ from a scientific assessment. The essential point is this: science is a critical tool for assessing the probability and consequences of risks; however, it must be considered within a broader social framework in order to understand what risk, and what level of risk, is important and acceptable to the public. Policy makers face the difficult task of determining estimates of risk that are both technically valid and socially acceptable.

1.4. How can risks be "managed"?

We all routinely deal with risk in our personal and professional lives. However, risk management requires us to move beyond intuitive and implicit decisions about risk; it requires active management in a systematic, holistic, and integrated manner. Risks can be managed by changing either the nature of the consequences or the likelihood that a consequence will occur. This involves managing the activity or situation that creates the risk. Consider, for instance, snowboarding as a personal risk management problem. The activity has both upsides (i.e., the exhilaration and thrill of snowboarding) and downsides (i.e., the potential for injury or accident). One can make decisions to reduce the likelihood of an accident (e.g., riding on designated runs at your skill level) or the severity of a potential accident (e.g., by wearing appropriate protective gear). Strictly speaking, we do not manage the risk, but rather we manage the activities that create the risk. (For many environmental and health-related risks, the activity or situation would be termed a hazard since the consequences tend to be negative.)

For the public sector, an overriding concern in risk management is the duty of care to the public — risks should always be managed with the public interest foremost in mind. As well, deciding how the distribution of potential benefits and losses should be apportioned is an important aspect of managing risks.

2. Why Does Risk Management Matter?

2.1. *It helps to avoid unwanted events*

Good risk management will reduce the likelihood and severity of unwanted events. By systematically anticipating risks, assessing their importance, managing them, and learning as we move through this cycle, unwanted or negative events can be avoided. However, good risk management should also anticipate and proactively address future risks — proactive rather than reactive management. By being proactive in anticipating risks early and creating the conditions that avoid them, we can often overcome adversity.

2.2. *It provides new opportunities for innovation*

It is impossible to safeguard against all possible risks; seizing an opportunity will always entail risk. Aaron Wildavsky (1979), a well-known academic, characterized this dilemma in an *American Scientist* article titled "No risk is the highest risk of all." Taking risk is a necessary precondition for human development; if we ceased to take risks, the technical and social innovations required to solve many of the world's problems would dwindle. In fact, many of the risks in modern society are a result of benefits derived from social and technological innovation. However, foolish recklessness is not a prudent idea either. Instead, we need to chart a middle course where we address hazards — with associated uncertainties and ambiguities — in a targeted, rational, and efficient manner.

No innovative public servant can avoid decisions that involve risk, and therefore should have the skills and competencies to manage these risks. But how do public servants learn to manage the risks of innovation? On the job, we can imagine three ways: (1) from past personal experience and from the experience of others, (2) from trial-and-error experiments in areas where they have no experience, and (3) from more deductive approaches which extrapolate based on an overarching theory or mental model (i.e., from theory, to observation, to action).

In the first of these learning approaches, case studies are a useful tool for providing public servants with knowledge about a wide variety of past experiences. In the second approach, allowing public service managers to actively undertake trial-and-error management experiments — sometimes called adaptive management — is important. For the third approach, helping managers recognize how their mental models affect their understanding of risk — perhaps through scenario development, interdisciplinary efforts, and public dialogue — is valuable.

Many different frameworks have been developed to guide the risk management process. These frameworks often reflect the particular circumstances of the institution or organization to which they apply. For the federal government, there is a decision-making process for risk management in a public policy context (PCO 2000) as well as an integrated risk management framework (TBS 2001), which stress the importance of having a common risk management process. These frameworks are provided in Appendix A.

The basis of these processes — and in fact most risk management frameworks — is a cycle anchored in the four steps of identification, assessment, responding, and monitoring and learning (see Figure 2). Within each step of the process, regular and meaningful communication will improve the likelihood of success (CSA 1997). Viewing this cycle as a continual learning loop reminds managers of the need for thoughtful and regular feedback, learning, and improvement is critical to successful risk management.

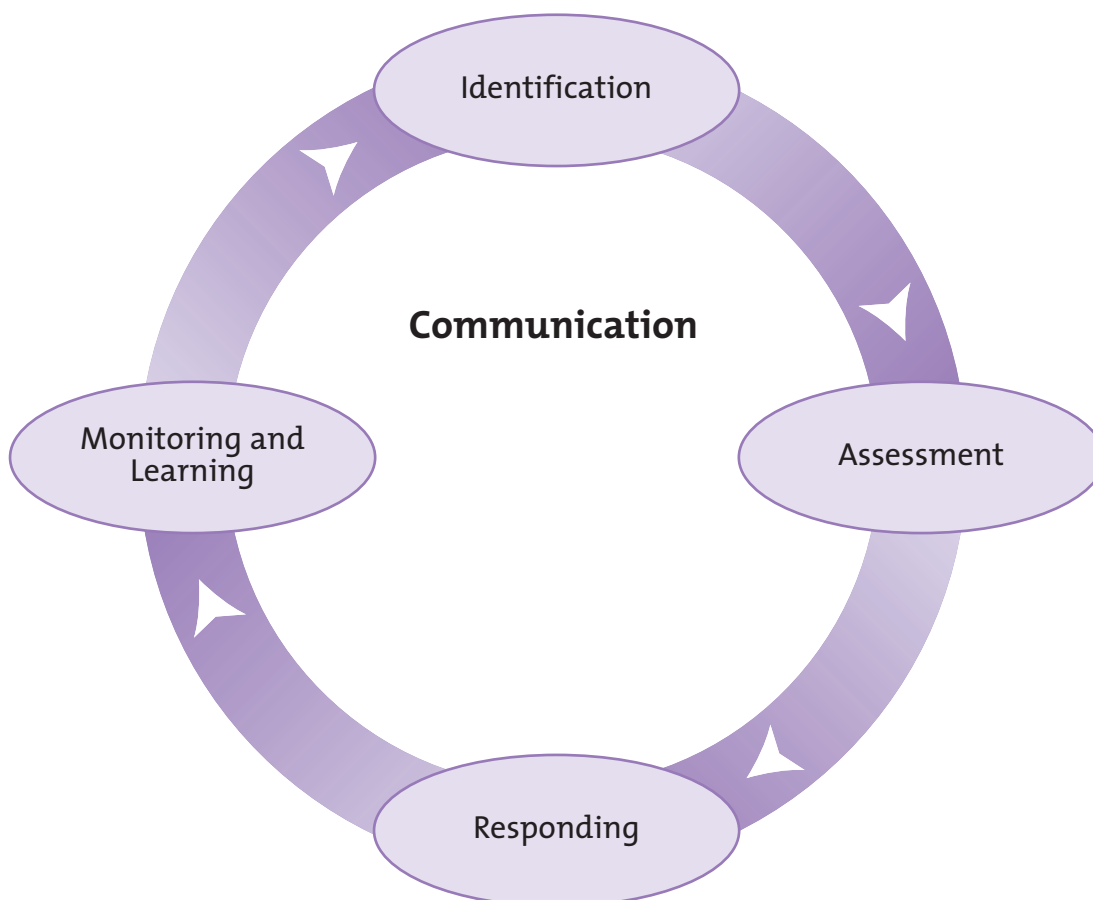


Figure 2. The basic risk management cycle

It will be repeated again within this document — since this cannot be stressed enough — that implementing a risk management program requires interdisciplinary effort: people from different organizations and disciplines to provide a holistic and systems perspective on the risk issues at hand. Risk management is about making trade-offs: reducing one type of risk will inevitably create another, potentially unforeseen, risk. For example, efforts to minimize an environmental risk may create unintended economic risks and vice versa. Ensuring that all risks are accounted for in decision making requires many different perspectives, and the rolling-up of risk from the unit to the organizational level. This is the purpose of integrated risk management: “...a continuous, proactive and systematic process to understand, manage and communicate risks from an organization-wide perspective. It is about making strategic decisions that contribute to the achievement of an organization’s overall corporate objectives” (TBS 2001).

3. Understanding Risks

3.1. *Identifying issues, setting context*

Identifying and acknowledging a risk is the first step toward managing it. Good risk management requires an ongoing effort to scan the environment for emerging and changing risk conditions. Anticipating future risks is critical to proactive management.

Referring to a generic list of risks often helps to ensure that potential risks are not overlooked or forgotten. Often, risks are classified according to the valued entity at risk, such as:

- human health and safety;
- environmental resources;
- property, buildings, or other assets;
- financial (e.g., exchange rates, interest rates, commodity prices);
- political and reputational;
- technological (e.g., Y2K, internet);
- operational (organizational interruption, liability);
- policy program (e.g., justice, immigration); and
- legal liability.

Appendix B contains two examples of risk identification lists that might prove useful for risk identification exercises. Recognizing and identifying risks, particularly new risks, requires interdisciplinary and holistic efforts.

3.2. Assessing key risk areas

3.2.1. Empirical risk characterization

Technical risk has been defined as the likelihood or probability of an event times its impact or consequence. There are a number of technical processes for the scientific assessment of risk and these vary depending upon the domain of the risk assessment. For example, environmental impact assessment methodologies have been improving over the past thirty years; product assessment methodologies are established for drugs, foods and other consumer goods; health risk assessments for chemicals are becoming increasingly sophisticated; and financial risk assessment methods are established in business. What these various assessment methodologies share is a need to predict the likelihood of future events. There are two general approaches for doing this:

- using historical information to predict the likelihood of future events; and
- modeling the future.

The first approach might, for example, use historical statistics from accidents and illness to create databases to predict insurance rates. However, many low-probability and high-consequence events lack adequate databases and this can be problematic for assessing risk. An example of the second approach is the use of computers to model climate systems to predict expected outcomes from increasing greenhouse gases in the atmosphere. In this case, there is no historical precedent to directly inform the prediction and databases are not present. Rather, scientists use their knowledge of climate behaviour to create predictive models.

3.2.2. Intuitive risk characterization

Identifying the issues and risks people are concerned about is fraught with controversy, particularly for health and environmental risks. Public attitudes toward risk often differ from those of experts and policy makers. Take, for example, the story of nuclear energy: when the technology was first developed, engineers and scientists felt that the benefits of this technology far outweighed what they determined to be very small risk whereas the public was very wary of the technology.

The public has a much richer definition of risk; one that is influenced by an array of psychological, social, institutional and cultural factors (Slovic 1987). The complexity of the public's understanding reflects the multiple criteria involved in their construction of risk; it is not wrong, simply different from that of the expert assessor (Fischhoff 1995). Appendix C shows some factors that affect how risk is perceived.

4. Developing a Risk Management Strategy

4.1. Setting objectives

It is critical to have a clear direction for risk management. This entails that objectives be set — objectives that stem from the intuitive and empirical assessment of a risk. Although these objectives can and will likely change over time, they are important for mobilizing support for a strategy. They also provide a benchmark against which to measure success. Objectives should also be consistent with legal, statutory, and international requirements of government.

4.2. Developing options

Public sector risk managers have a number of instruments at their disposal for managing and minimizing risks, and for dealing with the impacts from potentially adverse outcomes, should they arise. These instruments vary in their degree of coercion from direct regulation, to economic instruments, to voluntary initiatives, to education, and communication.

4.2.1. Determining what constitutes an adequate degree of precaution

For many well-defined issues (e.g., some types of health risk assessment), the cause-and-effect relationships are sufficiently well understood by scientists to resolve our risk questions. However, for situations where complexities are significant and cause-and-effect difficult to define (e.g., social systems, climate systems, ecological systems), science has more trouble predicting outcomes and assessing probabilities within a comfortable margin of certainty. When insufficient knowledge or information results in scientific uncertainty, in particular for situations where potentially adverse outcomes may be significant or irreversible, application of a precautionary approach has been advocated (Appendix D provides a conceptual description of the precautionary approach).²

Given the ambiguities regarding what constitutes a precautionary approach for different decisions, extensive dialogue between government, the public, and interested stakeholders is needed to determine the underlying principles for determining, implementing and evaluating an acceptable course of action. We need to demystify the concept, to improve horizontal understanding among stakeholders and create a strong network of expertise. It would also underpin work to conceptually define, in clear language, the distinguishing characteristics of the precautionary approach and the guiding principles that promote informed, consistent decision making but with sufficient latitude to accommodate diverse programs. Ultimately, work is needed to arrive at a rigorous, credible and transparent process for decisions that are consistent and defensible in the eyes of domestic and international stakeholders.

5. Implementing a Risk Management Strategy

Implementing a risk management system requires that responsibilities and accountabilities for carrying out the program be determined and assigned. The organizational structure and incentive system should be aligned with the goals and objectives of the risk management program. Those responsible for carrying out the program should have the necessary abilities to implement the strategy. Training and education should be provided for specific competencies in need of development. Managerial competencies in organizational behaviour, team leadership, and change management will also be required to implement a risk management strategy. Responsibilities and accountabilities for implementing a strategy should be clear to all public servants. Objectives, strategies, and processes should be well documented and available to stakeholders.

² We note that the Deputy Ministers' Challenge Team on Law-Making and Governance has been tasked with developing federal consensus on the precautionary approach and building up linkages between potentially divergent interests.

6. Acquiring Feedback for Learning

6.1. Evaluation, monitoring and reporting

There are two considerations in determining if a risk is being managed effectively: the process being used; and the results from that process.

The process should be systematic and comprehensive — as the frameworks in this document describe. It is important to continually examine how public sector risk-based decisions are being made. Is the process comprehensive? Is it clear and transparent? Is the appropriate public adequately involved? Evaluating your risk management processes can be a valuable source of feedback, especially when this is done by an outside person or group. Or perhaps more simply, a checklist or self-audit of the risk management process can provide timely feedback.

The results for each specific decision will depend upon the specific nature of the risk at hand, and should be compared against the goals and objectives of the risk management program: Were the objectives achieved? Were they the right objectives? Unfortunately, in some cases a good process will result in a bad outcome; this is to be expected. However, a good process should also ensure that bad outcomes are recognized early and that changes and modifications are made.

6.1.1. Developing indicators based on objectives

In order to determine whether or not a risk management program is successful, it should first be clear what that program is trying to achieve. The more clearly stated the objectives, the better.

6.1.2. Developing indicators based on process

Indicators that provide feedback on the risk management process should also be developed. For example, does the process align with a framework such as the *Integrated Risk Management Framework* (TBS 2001)?

6.2. Using evaluation results to improve future risk management

Feedback should be sought for both the process and substance of risk management. This feedback is essential for learning and improvement. An organizational culture that is willing to learn and recognize where improvement can be made is important. If public servants are afraid to admit the shortcomings of previous decisions, then learning becomes difficult. It also leads to an inability to change course and be innovative. Creating a learning culture will be challenging; it is imperative to accept initiatives that make the lessons learned from past mistakes widely available.

While incremental learning is significant, there is also a need for deeper learning, learning where broad direction and assumptions are questioned and evaluated. In addition to asking: "How can we do this better?" the deeper question: "Why are we doing this at all?" should be asked. This type of review and feedback requires critical analysis and reflective thinking.

Results and feedback from risk management are not only important for those public servants responsible for managing the risk, but also for the general public. Thought should be given to the most suitable form, language and level of detail of communication regarding the results of risk management efforts.

PART III – FOUNDATIONS OF RISK MANAGEMENT

LEARNING STRATEGIES: PROCESS AND PEOPLE

By exploring the process of good risk management in Part II above, we have identified a number of foundations for creating an effective risk management learning strategy. The Roundtable recommends that the elements provided below become central to a public service risk management curriculum.

7. The People Who Manage Risks

A risk management system will not magically appear or spring forth from a binder sitting on a bookshelf. Rather, it requires an ongoing effort at many levels to enable the people within an organization to anticipate, assess, manage, seek feedback, and learn about risks. At the centre of this effort are the public service executives, managers and employees with risk management responsibilities. These people will require the competencies and ability to change their organization's approach to risk. Without the proper skills, risk management will remain a peripheral concern.

A good risk manager would have some, and maybe all, of the following attributes:

- a proactive attitude toward dealing with risk and an ability to undertake prudent experimentation and adaptive management;
- an ability to admit and learn from mistakes;
- knowledge and ability to apply a rational, comprehensive decision-making process for risk management (i.e., a framework);
- an ability to recognize the role of science in risk management and to recognize and deal with uncertainty;
- an ability to communicate with stakeholders about risk and how it is being managed, empathy, honesty, and integrity in dealing with stakeholders, and an appreciation of the nature of risk as both a social and technical construct;
- an ability to approach problems from a systems rather than a one dimensional perspective, and an ability to recognize one's own biases and assumptions;
- an ability to anticipate future risks, perhaps through techniques such as scenario planning;
- an ability to work in interdisciplinary and cross-functional teams; and
- professional managerial competencies in developing the organizational systems, structures and incentives for implementing risk management programs.

Building on these insights, this section of the paper explores the people dimension of risk management. We differentiate between knowledge — the things someone knows — and competencies — the things that someone is able to do. A sports analogy might point to the difference: having knowledge about hockey is important if you want to watch or coach the game; being able to skate and stickhandle is essential if you are actually going to play. We also create a separate listing for what we call culture, values and beliefs. These are the unwritten but widely understood norms that often dictate what people are able or willing to do. To follow the hockey analogy, you may be the best player on the ice but you remain part of a team — you can only win if everyone is playing from the same playbook.

“The government's ability to manage risks rests on the skills of its people. The issue of risk management capacity is therefore broader than the related concern for science capacity. Beyond the need for scientists to conduct good science, effective risk management in a public policy context also requires a capacity for asking the risk questions about science, risk, public perceptions and policy options, and how each of these may be related.”

(Privy Council Office 2000)

Knowledge, which can be gained through education and training, is easier to achieve than competencies, which require knowledge as well as practice and experience. For instance, a hockey player does not become a good stickhandler without practice. Even more difficult to change, as they require a consistent, concerted and collective effort, are the culture, values and beliefs within an organization. Training through a course on risk management is a necessary place to start in creating the knowledge, competencies and culture for effective risk management — but it is insufficient on its own.

Wherever possible, we have also attempted to identify the level of manager to which each dimension of knowledge is most appropriate. While we hope that this is useful information, readers should attempt to consider these dimensions from their own specific situation. Responsibilities will be different in each department and, as a result, the suggested appropriateness for a particular attribute can only be described in general terms.

7.1. Knowledge

7.1.1. Knowledge of fundamental concepts in risk management

Having a sound understanding of the different aspects of risk management is obviously important: the general risk decision-making process, the importance of risk communication and dialogue, key concepts such as the precautionary principle, and the role of science and experts in risk decision making. This knowledge is critical for all public servants.

7.1.2. Knowledge of the situations that create risks

Successful risk management requires more than having a good decision-making process or the right attitude. Risk managers must also have a good understanding of the situations and activities that create risks and the types of outcomes that may arise from these activities. For instance, a senior career public servant from one department — say Finance — will have a great deal of knowledge about many things, but is not likely to be sufficiently well-versed to manage risks for another department, say Environment. For this reason, cross-departmental and interdisciplinary efforts are required to ensure that the appropriate knowledge is brought to bear on all issues at hand.

7.1.3. Understanding how trust is lost, built and maintained

Trust allows government institutions to make decisions that will be acceptable to the public. As the trust of stakeholders and the public declines, much more effort must be invested in finding acceptable risk decisions. As a result, action to build trust and secure public confidence has become a significant concern. Trust was deemed sufficiently important during Roundtable discussions that it is the focus of a separate report and should be consulted for a more detailed review (CCMD 2001). The essential components of trust outlined in that report include:

- integrity,
- competence,
- empathy, and
- openness.

Trust and confidence will be built over a long period of time through competent management of technological, biophysical, and social risks. However, it is inevitable that mistakes and unintended consequences will occur. There is growing evidence that concerted action to make risk decisions more democratic, through public involvement and communication, enhances the confidence in the decision — regardless of the outcome — and, by association, the trust in the institution responsible for the decision. As a result, public involvement in a clear and explicit process will tend to build trust in government organizations. As well, the manner in which mistakes are managed is important for creating and maintaining trust. Cover-up attempts are usually bound to backfire and they magnify the public perception of negative consequences.

7.2. Competencies

The competencies described below are important for all public servants. However, the emphasis will differ depending upon the role of a particular public servant.

7.2.1. Risk communication and stakeholder involvement

Risk communication involves early and regular dialogue about the assessment of a risk, the acceptability of a risk, and the ways of dealing with a risk. The goal of this dialogue is for all involved to recognize and appreciate the perspectives held by other parties. This knowledge ideally will allow for a better and more robust decision, one that examines the risk from many perspectives (i.e., a systemic view) and creates a shared vision of how a risk should be handled. While consensus will remain an elusive goal, the elimination of misunderstanding and mistrust is within grasp.

Many academics have explored how experts differ from lay people in their perception of risk. The public — and, indeed, public servants — deal with risk in a very personal manner: Does it affect them directly? In contrast, experts attempt to determine acceptable levels of risk by comparing these across the general population. The public also typically seeks absolute "yes" or "no" answers to risk questions, whereas experts are accustomed to dealing with statistical probabilities. Figure 3 presents some characteristics of these two perspectives of risk.

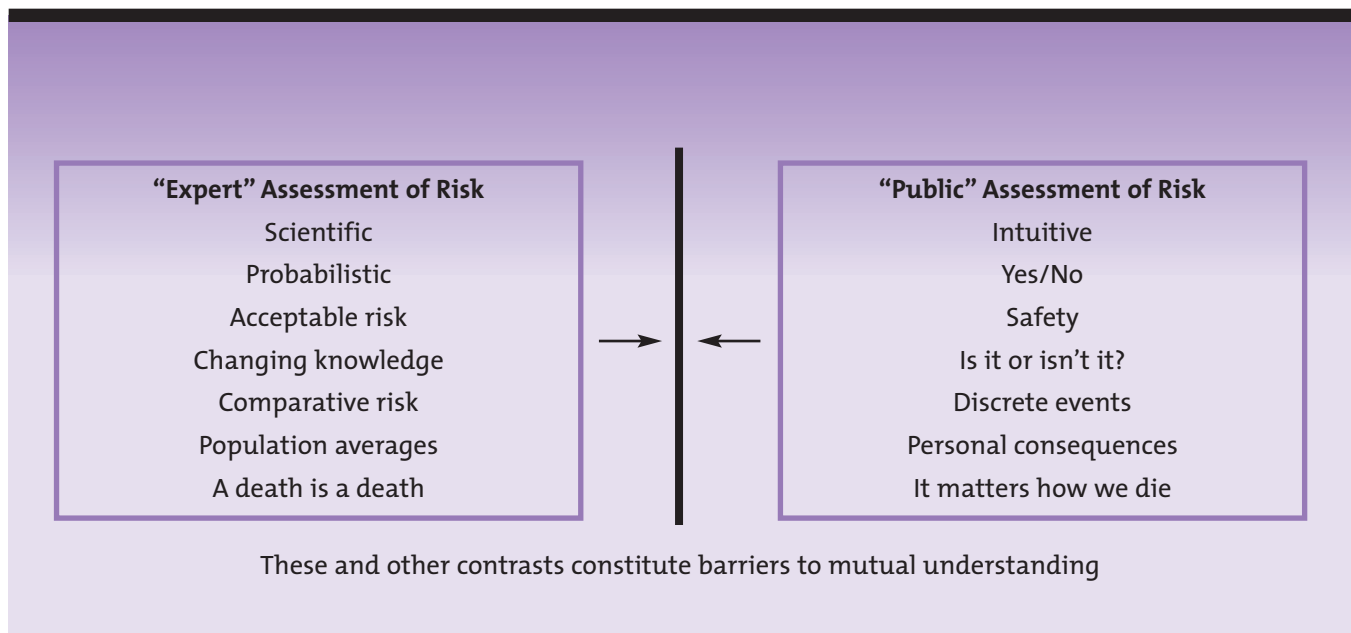


Figure 3. Some characteristics of the expert and public views of risk (Powell and Leiss 1997)

The People Who Manage Risks

Scientific and empirical assessment of risk is critical to good risk management but it does not paint the complete picture of a risk's acceptability. It is now widely acknowledged that management based solely on an empirical risk characterization is unlikely to succeed. Public values and perceptions should be incorporated at every stage of the risk management process. Good risk management will balance the analytical abilities of science with the democratic virtues of public dialogue and involvement.

Risk communication skills are important for any public servant who regularly deals with the public and stakeholders, whether that public servant is an assistant deputy minister or a risk analyst. Employees who do not regularly deal with the public still must understand the concepts behind and importance of risk communication and dialogue in improving a decision.

Competencies for successful risk communication include listening, speaking and writing, group facilitation, and negotiation and mediation skills. Recall that integrity, competence, empathy, and openness are important to building and maintaining trust, which is essential for good risk communication. Simply saying that these skills are important does not do them justice: being able to truly listen and empathize with other people is not a trivial matter. It is the crux of meaningful dialogue. Good risk communication will come easily for responsive organizations. A responsive organization, and the people within it, are continually trying to learn from stakeholders and the interested public.

At times, information will be confidential for such important reasons as security, personal privacy, and commercial confidentiality. Too often, however, information is treated as confidential for no apparent

“Risk assessment is inherently subjective and represents a blending of science and judgment with important psychological, social, cultural, and political factors . . . Whoever controls the definition of risk controls the rational solution to the problem at hand. If risk is defined one way, then one option will rise to the top as the most cost-effective or the safest or the best. If it is defined another way, perhaps incorporating qualitative characteristics and other contextual factors, one will likely get a different ordering of action solutions. Defining risk is thus an exercise in power . . . The limitations of risk science, the importance and difficulty of maintaining trust, and the complex, socio-political nature of risk point to the need for a new approach — one that focuses upon introducing more public participation into both risk assessment and risk decision making in order to make the decision process more democratic, improve the relevance and quality of technical analysis, and increase legitimacy and public acceptance of the resulting decisions.”

(Slovic 1999)

useful reason. What is required is a more open attitude toward public access to information or, perhaps even more importantly, a proactive attitude to sharing information. For contentious risk issues, the public should be proactively engaged rather than allowing an information vacuum to be created, only to be filled with misunderstandings.

A good recent example of poor risk communication comes from the response to genetically modified foods (Leiss, in press). Biotechnology was viewed as a panacea to many of the world's problems: increased global food production could be obtained with drastic reductions in pesticide use and reduced land and water requirements. Although the scientific experts from both government and industry downplayed concerns regarding genetically modified foods, some members of the public — particularly in some European countries — became averse to the risks. In 1997, the European Commission voted to prohibit genetically modified corn from the U.S., and Greenpeace launched an aggressive campaign against genetically modified foods. In addition, major food retailers such as Marks & Spencer and Nestlé announced they would phase out genetically modified foods in response to consumer concern. While the story surrounding genetically modified foods is still being played out, there are some clear lessons to

date. In protracted risk controversies, questions about the role of scientific knowledge and public involvement are central to the controversy. Without early, regular and meaningful communication and dialogue about the importance of a risk and how it should be managed, controversies will inevitably emerge.

7.2.2. Systems thinking

Systems thinking helps us to identify unforeseen risks. Complex systems are difficult to predict and often depend upon the actions of others or are otherwise beyond our control. Systems thinking helps to understand how different components and actions affect the overall system. Understanding how a system is changing and evolving is critical to managing the risks presented by these changes.

Systems approaches encourage people to view the world from a broad perspective that includes structures, patterns and processes of a system — the system dynamics — as opposed to just the events themselves. This broad view helps to identify the root cause behind a risk and where to work to address it. When we fail to grasp the systemic source of problems, we are often left dealing with symptoms rather than the underlying causes.

A systems approach is fundamentally different from traditional forms of analysis, which involve the separation of the subject into individual pieces for study. In contrast, systems thinking focuses on how the thing being studied interacts with the other parts of the system by expanding the view to take into account larger and larger numbers of interactions. This can result in strikingly different conclusions than those generated by traditional analyses, especially when what is being studied is dynamically complex. Often systems approaches involve simulating or modeling the system under consideration, in many cases using computer software in an attempt to recreate the system.

The ability to use a systems approach in problem solving is important for all public servants, but particularly those who are responsible for complex problems. This might typically include senior bureaucrats such as deputy ministers, assistant deputy ministers, directors general, and directors.

7.2.3. Scenario planning

The ability to anticipate risks is critical to their management. Scenario planning is one competency that can improve foresight. The process of creating scenarios is highly interactive and imaginative. Creating scenarios usually involves rigorously challenging the mental models that shape one's perceptions, and then searching for relevant information, often from unorthodox sources. The next steps are more analytical: identifying the driving forces (social, economic, political, and technological) and the predetermined elements (i.e., what is inevitable about the future). These exercises culminate in three or four carefully constructed scenarios. In practice, scenarios resemble a set of stories, written or spoken, built around carefully constructed plots with sound logical foundations.

The stories described within each scenario provide one way of organizing knowledge; when used as planning tools, they can spawn fresh insights. The test of a good scenario is not whether it portrays the future accurately but whether it enables an organization to anticipate, learn and adapt by considering the implications for their organization.

In the last 30 years, in the face of increasing uncertainty and complexity, many corporations and other large organizations have developed sophisticated scenario planning processes. Royal Dutch Shell made the tool famous by using it to great effect twice — once to anticipate the oil crisis in the 1970s, and then again to anticipate and prepare for the dramatic drop in oil prices during the 1980s.

Senior management will need to rely on scenario planning to provide an early warning system to help anticipate unforeseen risks. Senior managers will need to understand the importance of scenario planning, how the scenarios are developed, and how to interpret the ramifications of scenarios for their organization. Whereas policy analysts and strategic planners may be responsible for creating detailed scenarios, senior management needs to be prepared to effectively analyze and respond to this work.

7.2.4. Interdisciplinary teamwork

Teams are formed so as to achieve goals that individuals would be unable to achieve by themselves. Interdisciplinary teams are formed to tackle tasks that would benefit from creative thinking and the input from a diversity of professional backgrounds and departments. Not every task or goal is amenable to work in teams but, in many cases, a group of individuals will achieve greater and better results as a collective unit than as individuals.

The public service is searching for means to harness the creative energies of their employees and empowering workers, with the hope of achieving innovative results. As a consequence, people are increasingly being called upon to be part of interdepartmental and interdisciplinary work teams. This is possible when departments provide the support, training, and reward systems necessary to achieve the superior results that teams can generate. In addition, all public service managers will benefit from the interpersonal and managerial skills needed to be part of a successful interdisciplinary team.

What is it that makes a team so effective? Consider the example of a sports team. What essential attributes allow a team of moderately skilled athletes to defeat a skilled team? What makes the "Cinderella story" sports team come alive? How can these insights translate to the workplace?

Katzenbach and Smith, in their best-selling book *The Wisdom of Teams* (1993, 45), describe a team as a "small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable." In essence, they view the need for clear goals, set both by external pressures and internally by the team, as an overriding necessity for a successful team. They also view the skill-set that team members possess as being important, including technical or functional expertise, problem-solving and decision-making skills, and interpersonal skills. However, they point out that too much emphasis can be placed on skills in selecting team members. Teams should be considered powerful tools for personal learning and development, and successful teams will quickly identify skill gaps and work to fill them. A team is also viewed as a group that will succeed or fail together (i.e., mutual accountability). With the components described in its definition, a team can become much greater than the sum of each individual's contributions.

David Bohm, cited in Peter Senge's book *The Fifth Discipline* (1990), describes two broad criteria for effective interdisciplinary teams:

- Team members must "suspend their assumptions" by being aware of the assumptions that each one is holding and letting others know of them. Suspending assumptions or making mental models explicit is a particularly powerful tool in interdisciplinary teams. Thought continually deludes us into a view that "this is the way it is." The team discipline of suspending assumptions is an antidote to that delusion. Many important management skills, such as those related to creative problem solving and systems thinking, involve the coordination of one's assumptions or mental models with those of other people. One way to clarify and check mental models and assumptions is by attempting to make them explicit to others and seek feedback from these people. Essentially, it is important not to assume that someone else shares your assumptions — it is always useful to get these out in the open.
- Making mental models explicit is supported by the presence of an openness and trust that allows team members to "drop their shield" and suspend their assumptions. This allows each member to acknowledge the mutual risk of placing assumptions on the table and creates a sense of respect and safety.

7.3. Culture, values and beliefs

7.3.1. Exploratory learning, experimentation and adaptive management

In order to identify new opportunities, both within the organization and in the external environment, "exploratory learning" should be supported. Exploratory learners actively seek out new insights by scanning, analyzing and continually readjusting their direction of inquiry. They also delve into areas of inquiry that are not well known, thus requiring enthusiastic curiosity, a flexible mind (including the willingness to suspend judgment and use alternative methods), and an ability to synthesize lessons learned. To this end, both the risk management and organizational learning literature hail the benefits of experimentation, both in day-to-day activities and at important milestones in project or organizational life.

The common metaphor for guiding organizational and management thinking is the "organization as machine" (Morgan 1997). In this metaphor, an organization is a combination of precisely defined jobs linked together in a chain of command. The organization operates in a "command and control" manner where direction is provided from the top down. Strategy, objectives, and procedures are provided by a small group of executives who control the organization — the rest of the members are responsible only for carrying out their respective procedures. This metaphor has proven successful in structuring and managing organizations for many years and remains useful. However, it has limitations in a world of rapid change. The command-and-control approach may not help organizations adapt quickly to changing conditions; innovation can be difficult and slow.

As a result, some people now feel that a better organizational metaphor is the "organization as brain" (Morgan 1997) or the learning organization. In this metaphor, the organization is seen as a complex system capable of continual learning and innovation. The ability to process information about the external environment, imagine different possibilities, and learn and innovate is spread throughout the organization. Learning is a continuous process that takes place at the individual, team, and organizational levels. The advantage of attempting to create organizations consistent with the learning organization metaphor is simple: many more minds contribute knowledge and creativity thus spurring innovation and continual improvement.

Significant improvements and leaps forward normally require greater risk taking; innovation inherently involves risk, to the individual and/or the organization. Good risk management limits the negative consequences from innovation and allows for lessons to be learned before broader implementation takes place.

Providing public servants with room to experiment and learn from trial and error is good if two criteria exist: (a.) trial and error is the best way to advance an objective, invent, or innovate because of a lack of existing knowledge; and (b.) the potential adverse consequences that result are not too severe, in terms of a threshold agreed to by the organization (i.e., the stakes are not too high). Critical to the success of this experimentation is feedback and learning. Without those elements, no improvement will be made and innovation will become difficult.

Senge (1990) argues that increasing experimentation is only the first stage in moving toward learning organizations. The impulse to learn goes deeper than desires to respond and adapt more effectively to environmental change. The impulse to learn, at its heart, is an impulse to be generative — to expand our capability. Experimentation or adaptive learning, therefore, should not simply be used to cope with a situation. We must consider what we want to learn and how experimentation can help us accomplish this learning.

Exploratory learning, experimentation and adaptive management are important for junior and middle managers as they are the public servants most actively engaged in exploratory activities. Senior managers must support this type of learning and adaptive management.

7.3.2. Tolerance for mistakes

Effective learning about the risks we face requires a need to tolerate honest mistakes during experimentation and adaptive management. However, if tolerance of mistakes is allowed to degenerate into a "licence to fail," this can become a problem for an organization. Yet, there is a need to give individuals the freedom to make small and honest mistakes if trial and error is required to prevent excessive risk and potentially large problems. Learning is important in such cases insofar as individuals need to have the capacity to learn from mistakes, understand the tolerance threshold of an organization, and apply lessons learned in order to solve problems. It is also important to consider how mistakes will be managed. For example, Johnson & Johnson's handling of the Tylenol poisoning scare is often held up as a model. In that case, they quickly recognized the problem and took significant action to correct it (i.e., removed all bottles from stores voluntarily), followed by measures to prevent it from happening again (i.e., by designing plastic seals on the bottles).

Senior managers are most responsible for creating the conditions for this culture. Junior employees must clearly understand that honest mistakes during exploratory learning are acceptable, provided steps are taken to manage the risks of mistakes.

7.3.3. Proactive attitudes toward risk

Individuals and organizations have material interests and reputations to protect. This often leads to risk aversion. Moreover, risk aversion may be inherent to a specific individual's personality or an organization's culture due to bad experiences with risks taken in the past. The reverse may also be true, with individuals or organizations predisposed toward reckless gambling, or facing incentives that promote irresponsible risk taking. Successful risk management promotes a sophisticated, reasoned, and constructive approach to the application of risk. For junior and middle managers, this often requires new analytical tools to evaluate risks and the ability to conduct a mature self-evaluation of personal attitudes toward risk. For senior managers, this requires cultivating an environment that promotes constructive risk taking.

8. The Risk Management Process

Risk management is a systematic approach for making decisions when faced with uncertainty about the future. Accomplishing this requires the adoption and communication of an explicit process or approach.

8.1. Structures, systems and strategies

Organizational structures, systems, and processes that facilitate a systematic approach to risk management increase the likelihood that good risk decisions will be made. The individual public servants, no matter how capable they are at dealing with risks, remain part of the larger organization and are circumspect to the rules and norms within which they operate. The ability to effectively manage risk relies significantly upon the structure of an organization, and the systems through which the public servants operate. Senior executives within the public service (i.e., deputy ministers, assistant deputy ministers, directors general) will have the most important role in ensuring that structures, systems, and strategies for good risk decision making are in place. Creating a curriculum that provides senior management with the knowledge and management competencies to effect this change is important.

8.1.1. Establish clear accountability and responsibility for risk decisions

Although every public servant is responsible for risk management, there is a requirement for clear identification of the roles, responsibilities, and accountability within the risk management process (i.e., who does what, to whom, when and how). It is important to align accountabilities with authority; those who do not have the authority to make risk-based decisions should not be held accountable for these decisions. Ensuring that roles, responsibilities and accountabilities are clear does not mean leaving risk management up to one person or group. All members of the organization, regardless of their other roles, have a responsibility to contribute to a risk management system.

8.1.2. Get the incentives right

Incentive systems should encourage people to be risk aware: to be proactive and not reactive. Incentive systems should also encourage public servants to take prudent experiments and admit mistakes rather than try to hide them. Such decisions should result in arriving at an understanding that will minimize future mistakes and maximize future success. Incentives should also be given for the inclusion of stakeholder views in risk decision making and the building of trust toward government risk management, although it will be difficult to establish the criteria for such an incentive system. Senior public service executives need to ensure that current incentive systems are augmented and aligned to reflect new thinking on risk management.

8.1.3. Make the risk decision-making process explicit

Providing both the processes and criteria that will be used in reaching risk decisions is critical for the participants in those decisions. Stakeholders that have a clear understanding of the process being used to make a decision will place higher credibility in that process and be more likely to trust it.

8.1.4. Improve inter-departmental and interdisciplinary coordination

Creating the structures for interdisciplinary and inter-departmental coordination requires senior public servants to create the conditions that will allow effective teams to be formed. To create such conditions is, unfortunately, quite difficult:

All too often, teams in business tend to spend their time fighting for turf, avoiding anything that will make them look bad personally, and pretending that everyone is behind the team's collective strategy — maintaining the "appearance" of a cohesive team. To keep up the image, they seek to squelch disagreement; people with serious reservations avoid stating them publicly, and joint decisions are watered-down compromises reflecting what everyone can live with, or else reflecting one person's view foisted on the group. If there is disagreement, it's usually expressed in a manner that lays blame, polarizes opinion, and fails to reveal the underlying differences in assumptions and experience in a way that the team as a whole could learn (Senge 1990, 24).

There are reasons why effective teams are difficult to create. First, teams do not make decisions as quickly as an individual even though they usually lead to better decisions. Second, as a society we are trained and encouraged to espouse values of individualism. We are graded, promoted, appraised, and rewarded according to our individual performance and ability to "know the right answer." Further, individuals are rewarded not for examining complex issues but for advocating their own view or position. Organizations reward people for having an immediate solution for a pressing risk problem — few people are encouraged to raise difficult questions about an underlying or complex risk. These systematic hurdles present a significant difficulty to a team's success — at a time when solutions to complex risks are most needed.

Despite its importance, the ingredients needed for creating a truly effective team remain poorly understood. In addition, there are varying degrees of effectiveness — it is inherently difficult to measure the performance impact of a team. The model presented in Figure 4 represents much of the recent research and thinking surrounding the creation of effective teams. Five elements are thought to contribute to a team's effectiveness: (1) having clear external boundaries and expectations established by senior management; (2) allowing the team to take "ownership" of its specific goals; (3) having clear and well-defined roles that each team member will assume; (4) establishing the norms and procedures by which the team will operate; and (5) maintaining the networks and relationships needed by the team.

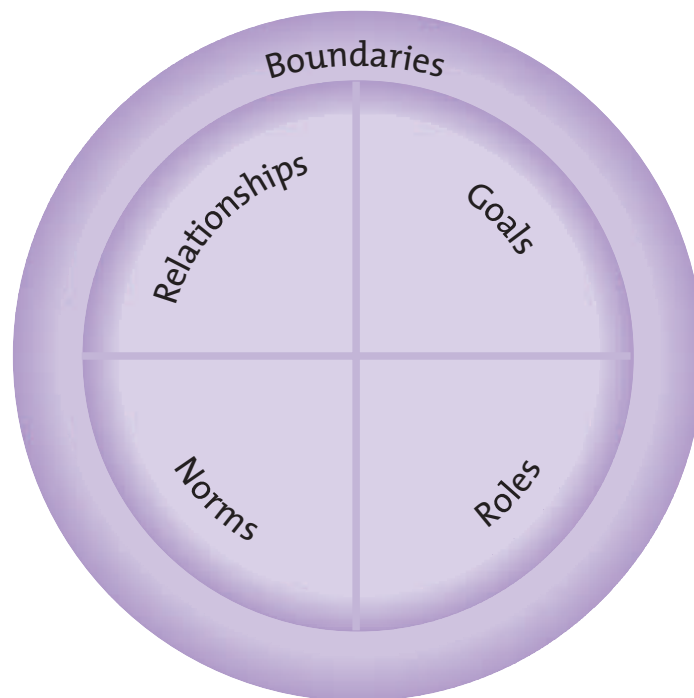


Figure 4. Team effectiveness model (Marc 1997)

The elements within this model can be defined in the following way.

Boundaries:

- the external expectations of the team
- the support provided to the team by their organization (physical, financial, emotional)
- representations of the context within which the team is working

Goals:

- the clear goals set by the team
- should be explicit, measurable, and agreed to by all members
- should be aligned with the boundaries

Roles:

- should reflect the external boundaries for the team (i.e., what is required)
- should reflect the skill-set each member brings to the team
- should reflect how each member contributes to the team goals, both substantively and procedurally

Norms:

- agreed upon norms, procedures, and values
- represent how the team will work together

Relationships:

- the network of people that are important in ensuring the team's success

By considering and reflecting upon these five elements when establishing and working within a team, effectiveness can be improved. These elements will not ensure a team's success but they do provide a useful framework for incorporating components that will assist in improving a team's effectiveness.

The external boundaries that support a team are crucial to its success. However, many organizations that appear to encourage teams, in reality do not provide the environment in which a high-performance, dynamic team could thrive. At a minimum, teams should be rewarded as a collective unit, not as individuals. Senior public service managers should also remember that interdisciplinary teams and the benefits they can accrue (i.e., creativity, innovation) require ample time, money, and patience. They require the time and resources to learn, create, stumble, make mistakes and, ultimately, succeed.

8.1.5. Clarify the role of precaution in risk management

Uncertainty needs to be acknowledged as part of risk management. It can arise from a lack of information or because the situation under consideration is simply too complex. There will be a period when a risk is first recognized during which uncertainty is high. However, as research reveals more information about an issue, this uncertainty will diminish. For example, there was a time when the perils of smoking were not clear — uncertainty was high. After decades of health research, there is some confidence in statements such as "smoking can cause cancer" or "smoking can cause heart disease" — uncertainty is low. Contention arises over what actions to take when uncertainty is high. We can see this type of contention over complex risks that are not well understood such as climate change and the loss of biodiversity. In situations with high uncertainty, the use of a precautionary approach or principle may be warranted. Application of this approach represents an emerging strategy for dealing with uncertainty, although application remains unclear. Clarifying how precaution will be used — under what circumstances, under what criteria — will provide people involved with a risk decision with clearer guidelines. The Privy Council Office's work under way on the precautionary approach should prove helpful in this matter (see Appendix D).

At the interface between science and policy, uncertainty should be carefully managed. It is of utmost importance for scientists and technical experts to communicate the degree of uncertainty to policy makers. In turn, this uncertainty must be communicated to interested stakeholders and the public. What is most important in deciding upon the course of action is not to make unrealistic claims of "zero" risk. All uncertainty should be explicitly acknowledged.

8.1.6. Clarify the role of experts and science in risk decision making

Risk management involves making decisions about the future. Science provides the foundation for making these predictions but it does not provide absolute certainty. As well, science does not provide insight into the values, beliefs and desires of people. Although science may be able to tell us about the risk of death from a particular activity, it may be that people are more concerned with how or to whom that death occurs rather than with the death itself. A statistical death informs our risk decisions, but it is not the entire picture. The scientist conducts the risk assessment and contributes to the scientific understanding of risk but is not usually responsible for the final decision. This situation ensures that the final decision reflects people's values and aspirations.



Figure 5. Illustrating the dynamics between science and policy

8.1.7. Monitor implementation and adjust direction

There is a need to constantly monitor the implementation of strategies, and to adjust direction as required. For organizational learning, this involves developing iterative feedback mechanisms that actively seek out (as opposed to passively receive) information. There are several types of feedback loops, including: (a) sensing external conditions as they emerge, relating them to strategies, and changing course as necessary ("single loop" learning); (b) questioning, challenging and changing strategies when they do not seem to correspond to reality ("double loop" learning); and (c) detecting inadequacies and adopting new assumptions and mental models when these appear ill suited to solving a particular problem.

8.1.8. Develop control systems to set the parameters of risk taking

Risk management requires experimentation and innovation to achieve objectives — taking "sensible" risks. Systems for rewards and sanctions should penalize reckless gambling (i.e., a bad risk management process) instead of sensible risk taking or honest mistakes. The expectations for taking risks should be made clear by senior executives and incentives to encourage a sound process put in place. This requires a couple of important learning considerations. First, acceptable levels of risk will likely be organizational and issue specific. The difficult process of determining risk acceptability should be made by gauging what constitutes acceptable levels of risk among various process stakeholders. Second, when establishing control procedures and parameters, it is important to ensure that they do not unduly hinder the organization's ability to achieve other objectives, or its capacity to learn.

9. Highlights of a Learning Foundation

The learning dimensions described in this section are summarized in Table 1. An attempt has been made to point out the public servants who would benefit most from education and practice in each relevant learning dimension. An attempt has also been made to assign a degree of relative importance for each learning dimension. There are obvious dangers in ascribing these labels to each learning dimension: each concept and each manager will have distinct learning needs, and these needs and their relative importance will shift depending on the context at hand. However, we make this attempt to create a starting point for organizations working to develop a risk management curriculum.

Table 1. Summarizing the foundation for learning strategies, the public servants to whom they are most applicable, and the relative importance of each in creating the conditions for effective risk management

Foundation for learning		Most applicable to . . .	Suggested importance
People			
Knowledge	• Knowledge of fundamental concepts in risk management	All public servants	High
	• Knowledge of the situations that create risks	Risk managers and analysts	High
	• Understanding how trust is lost, built and maintained	Those who communicate or work with the public and stakeholders	Medium
Competencies	• Risk communication and stakeholder involvement	Those who work with the public and stakeholders	High
	• Systems thinking	Middle and senior managers	Medium
	• Scenario planning	Senior and middle managers	Low
	• Interdisciplinary teamwork	All public servants	High
Culture, values, and beliefs	• Exploratory learning, experimentation and adaptive management	All public servants	High
	• Tolerance for mistakes	Senior managers	High
	• Proactive attitudes toward risk	Senior and middle managers	Medium
Process			
Structure, systems, strategies	• Establish clear accountability and responsibility for risk decisions	Senior managers	High
	• Get the incentives right	Senior managers	High
	• Make the risk decision-making process explicit	Senior managers	High
	• Improve inter-departmental and interdisciplinary coordination	Senior and middle managers	High
	• Clarify the role of experts and science in risk decision making	Senior managers	Medium
	• Clarify the role of precaution in risk management	Senior managers	High
	• Monitor implementation and adjust direction	Senior and middle managers	High
	• Develop control systems to set the parameters of risk taking	Senior and middle managers	Medium

10. Barriers and bridges to good risk management

This paper has outlined a number of barriers to good risk management. It has also proposed some broad principles and concepts for creating the knowledge, competencies and culture required to effectively manage risks within the public service. Barriers to good risk management can arise at every step of the risk management process. Consider these examples:

- overlooking important risks;
- failing to develop an explicit process for risk decision making;
- failing to clarify the role of experts and science in risk decision making;
- inadequately dealing with uncertainty that arises from incomplete information (e.g., a quick decision is required), immature scientific understanding, or the complexity of the risk;
- poor trust and understanding between stakeholders;
- conflicts over the perceived seriousness of a risk or the strategies for risk management;
- conflicts over fair and just apportioning of the potential benefits and costs of risk among different segments of the population; and
- inadequate institutional systems and structures for risk management.

Each of these challenges represents a hurdle with the potential to derail a risk management effort. The ways and means to overcome these barriers are not easy and will require ongoing effort from all levels of government. Table 2 summarizes some possible barriers and solutions to good risk management.

Table 2. Barriers and solutions to good risk management

The risk management process	Challenges in moving to the ideal	Potential solutions
Identifying the issue or risk	<ul style="list-style-type: none"> • overlooking important risks 	<ul style="list-style-type: none"> • scenario planning/foresight • systems approaches to risk identification • integrated risk management approach • horizontal risk management approach • cross-functional and interdepartmental teams
Assessing key risk areas	<ul style="list-style-type: none"> • quality and timeliness of information • dealing with uncertainty in the information • lack of understanding and trust between stakeholders 	<ul style="list-style-type: none"> • professional knowledge and competence regarding the risk assessment methods • being aware of, accepting, and communicating about uncertainty • creating an organizational culture of experimentation and adaptive management • allowing people to learn from mistakes • adopting the precautionary principle when appropriate • monitoring and auditing, continual improvement • integrity, competence, empathy, openness, risk communication and dialogue • consistent and well-understood decision-making process
Responding by developing objectives, options, and strategies	<ul style="list-style-type: none"> • prioritizing attention • risk communication and dialogue • minimizing risk 	<ul style="list-style-type: none"> • risk communication and dialogue • facilitated stakeholder negotiation • engagement, involvement, and consultation • expert and professional competence in policy development and analysis to determine effective and efficient policy instruments (e.g., regulations, economic instruments, voluntary covenants)
Implementing the strategies	<ul style="list-style-type: none"> • organizational systems and culture 	<ul style="list-style-type: none"> • public service education and training • creating a public service culture responsive to risk • developing clear responsibilities and accountability • developing clear and well-documented systems and procedures
Monitoring and learning	<ul style="list-style-type: none"> • monitoring both process and outcome 	<ul style="list-style-type: none"> • creating specific objectives for both the process and substance of risk management • developing indicators based on these objectives

11. Conclusions and Recommendations

Risk management is a complex combination of empirical analysis and public dialogue around the risks that we are worried about, the actions taken to control those risks, and the success or failure of these actions. Important concepts are risk communication and public involvement, the precautionary principle, and interdisciplinary and systems perspectives of risk. This paper has discussed these concepts in relation to the report of the ADM working group, *Risk Management for Canada and Canadians*, and the *Integrated Risk Management Framework* developed by the Treasury Board Secretariat.

The paper has also made suggestions regarding the knowledge, competencies, and culture required by public servants for effective risk management. Suggestions were made regarding the structures, systems, and strategies that we believe will create the conditions for public servants to effectively manage risks. Stemming from these learning dimensions of risk management, we propose a number of recommendations for improving risk management in the Public Service of Canada.

1) *There is a need to shift the culture of the public service so that it becomes commonly accepted that:*

- Risk management training tools and curriculum are important elements of successful risk management and should be developed and made available to those public servants who manage risks.
- Risk management is not a casual undertaking, but should be a core, systematic, and integrated function of government. Systemic and sustained effort is required for this cultural shift to occur. To this end, individual departments, particularly those that are directly involved in risk management, should evaluate their decision-making processes, culture, knowledge and competencies in risk management and compare these with the broad direction provided in this paper. Departments or agencies that manage risks should work to develop — or enhance their current — risk management courses. Ideally, departments will communicate with each other about their education and training needs and find synergies for developing these courses. As training and education needs become clearer, CCMD might be a useful conduit for developing and delivering course content for managers.

2) There is a need for a government centre of risk management expertise.

- There is a need for a single point that public servants can access for tools and learning and development needs. Such needs could be filled in partnership with training institutes with expertise in risk management. These advisors could be available for one-on-one discussion, advice and idea sharing with managers. This group could be located at TBS, or work in close contact with TBS's Risk Management Division, and could include public or private sector practitioners and academics.

3) There is a need for improved risk management education and training.

- It is recommended that CCMD explore the development of a course (or courses) on risk management for public service managers. Such course(s) would introduce basic concepts and provide a foundation for further training in the area. CCMD and other organizations should also consider developing more content specific courses or course components for the key dimensions mentioned in this paper.

Within courses, interactive learning tools such as case studies would allow individuals to interact with and compare strategies with others. For instance, risk managers could be presented with various kinds of risk management scenarios. They could be encouraged to explore the same situation from different perspectives and compare their perspectives and mental models with others. Such an interactive experience can teach important principles, strategies and skills of systems thinking and problem solving by engaging people in actively discussing their perspective and then prompting critical self-analysis of their choices. It can also promote the value of using different ways to represent and present risk information.

Contemporaneous case studies of contentious issues will likely create the most interest and interaction among students in a risk management course. These cases may be potentially sensitive, particularly if there were a great deal of media and public scrutiny surrounding them, some of which could be ongoing stories. Because of this, publishing a series of risk management case studies may not be particularly easy, although it is surely the most effective means of making this information widely available to public servants. One way of overcoming the problem might be to invite guests to share their insights and enter a dialogue about a particular case study. This would create a greater interactive experience for students.

- In order to provide wisdom and guidance to CCMD and others developing courses on risk management, there is a need to develop associate faculty members or identified mentors for risk management. This group could be composed of persons from all levels and a range of areas (e.g., technical, middle and senior management involved in areas such as environmental, legal, or financial risk) and thus ensure a spectrum of expertise and multidisciplinary advice.

11.1. *Postscript: The way ahead*

After reading this paper, the reader should have a good idea of the basic concepts of risk management and the changes in knowledge, competencies, and culture that can help improve how an organization manages risk. The conclusions reached here provide general recommendations for the public service and government departments and agencies. However, more specific recommendations for managers wanting to improve their group or organization's management of risk have not been explicitly addressed; and this section makes an initial attempt to remedy this, although further work is needed in this area. The following list suggests a place for managers to start to improve their organization's management of risk.

1. Evaluate how well your organization or group approaches risk management. What are the strengths and weaknesses? Where is improvement needed? This may involve a self-assessment of your risk management programs alongside an external (e.g., other department, external consultant) gap analysis. The ADM working group report and the *Integrated Risk Management Framework* developed by the TBS provide useful benchmarks for this gap analysis.
2. Evaluate your employees' knowledge about risk management concepts. Do they have a good grasp of the fundamental concepts? Do your risk specialists have the opportunity to stay abreast of technological and methodological advances? Is your organizational culture responsive to risk?
3. Talk with others involved in risk management; build a network of experts and colleagues who can provide advice and assistance. The TBS Risk Management Division would be a good place to start building this network.
4. Determine if you have the required specialized knowledge to identify and assess risks, develop appropriate policy and management responses, and communicate about risk issues.

The Roundtable believes that following through on the above recommendations will help the public service to manage risks more effectively.

Conclusions and Recommendations

Additional Teaching and Learning Resources

5. Develop a strategy to address the shortcomings you have found. This strategy might include a risk management curriculum; mentoring opportunities; self-directed learning (e.g., online text and courses); external training, particularly for specialist knowledge; and risk management "practice" with case studies. Specialists such as those who assess risks and analyze and develop policy options will require opportunities to update and maintain their professional competence through international conferences and courses. Likewise, managers will require opportunities to update and maintain their professional competencies surrounding risk management.
6. Establish goals and objectives for your learning strategy and monitor your organization's success in meeting these aims. If the objectives become less relevant, update them. If they are not being met, make changes to the strategy.

While undertaking the difficult work required to improve risk management, managers should remember that smart risk taking is an essential component to a dynamic and innovative public service. Effective risk management will encourage innovation because it provides a framework for making good risk decisions.

12. Additional Teaching and Learning Resources

12.1. Federal Government

12.1.1. Privy Council Office: Assistant Deputy Minister Working Group on Risk Management

- *Risk Management for Canada and Canadians: Report of the ADM Working Group on Risk Management* (March 2000). Available online at www.pco-bcp.gc.ca/public_e.htm. [This is a very good overview of the issues in risk management and public policy. The report includes a useful framework for risk management and public policy and has made significant contributions to risk management in the public service.]

12.1.2. Treasury Board Secretariat

TBS documents are found at www.tbs-sct.gc.ca — go to Policies and Publications, Risk Management, Policies and Publications.

- *Integrated Risk Management Framework* – [As part of strategic risk management, TBS in close consultation with federal and private interests, has developed an integrated risk management framework for government-wide use; it sets out the context and structural elements to help organizations build on existing practices to implement a comprehensive, integrated approach to risk management.]
- *Best Practices in Risk Management* — Coordinated Conclusions from PMN and KPMG (1999-04-01). [This document provides a summary of the joint conclusions found in the two studies listed immediately below on best practices in risk management. It is succinct and useful.]
- *Best Practices in Risk Management: Private and Public Sectors Internationally* (1999-04-27).
- *Review of Canadian Best Practices in Risk Management* (1999-04-26).
- *Risk, Innovation and Values — Examining the Tensions* (1999-04-15) [This document examines the tension that exists between the desire for innovation in the public sector and an aversion to the risk of failing and public scrutiny.]
- *Annotated Bibliography for the Study on: “Best Practices in Risk Management: Private and Public Sectors Internationally”* (1999-10-01).

12.2. Conference Board of Canada

Canadian Council on Risk Management — www.conferenceboard.ca/ccrm

Members (about 30) of the Council are senior executives in charge of risk management at prominent Canadian organizations, both public and private. The Council activities are steered by an advisory committee, drawn from members, who provide input on the research agenda and proposed meeting agendas via conference call. There are two meetings per year.

Global Council on Risk Management — www.conferenceboard.ca/gcrm

The Conference Board has produced a number of good documents. The two listed below were felt to be most appropriate to the public service.

- Kimberley Birkbeck, *Forewarned is Forearmed: Identification and Measurement in Integrated Risk Management*. February 1999
- Lucy Nottingham, *A Conceptual Framework for Integrated Risk Management*. September 1997

12.3. Canadian Standards Association

“Risk Management Guideline for Decision-Makers: A National Standard of Canada.” (CAN/CSA-Q850-97). October 1997. [This document is an excellent starting point for understanding the basic elements of a risk management system or decision-making process. It is recommended for anyone who regularly deals with risk issues.]

12.4. Canadian Institute of Chartered Accountants

- *Guidance on control*. Toronto: 1995. [Written by the CICA Criteria of Control Board. This document describes a framework for designing, implementing and continuously improving control in order to help achieve organizational objectives. Specifically, the publication sets out criteria for effective control in an organization, including a definition of control and twenty "criteria of control," and provides a framework for developing, assessing and changing control.]
- *Learning about risk: choices, connections and competencies*. Toronto: 1998. [Written by the CICA Criteria of Control Board. This document examines generally the nature of risk and offers some risk models. It offers some propositions about how risk identification and assessment are addressed.]

12.5. Online

Risk World. www.riskworld.com. [This site provides a thorough overview of risk topics as well as an up-to-date news service for risk-related information. It is a very good starting point for researching risk management issues.]

12.6. Academic

There are a number of academics in Canada with an expertise in risk management.

12.6.1. Centres, Institutes and Chairs Related to Risk Management

Institute for Risk Research, University of Waterloo — workbench.uwaterloo.ca/irr [The Institute for Risk Research (IRR) conducts research on risk management and acts as a knowledge base to assist Canadian governments, public organizations and industry in risk management decisions and policies. Research and development on measures of safety, risk management of dangerous goods, safety of blood systems, etc. The IRR Web site has a link to the Network for Environmental Risk Assessment and Management (NERAM), which is run by the IRR.]

Chair in Environmental Risk Management, University of Alberta — www.ualberta.ca/~envrisk/erm.html [Research into environmental and health risk management.]

Chair in Risk Communication, University of Calgary — www.ucalgary.ca/~wleiss [Research into risk communication and public policy issues.]

Program for Risk Professionals, Simon Fraser University — www.sfu.ca/cstudies/pd/frm/ [This is a continuing education program geared toward financial risk management. The Canadian Risk Management Council of the Risk and Insurance Management Society, Inc. sponsor the program.]

12.6.2. Some Important Journals

Risk Analysis — the journal of the Society for Risk Analysis, www.sra.org. Published by Plenum Press. [A well established journal with a focus on scientific risk assessment journal for health, environmental and technical risks, although it regularly has articles examining risk from a social science perspective. This journal represents a good starting point for reviewing academic thinking on particular risk issues.]

Journal of Risk Research — the journal of the Society for Risk Analysis (Europe and Japan). Published by Routledge. [A new journal, started in 1998, that focuses on social science perspectives of risk.]

Risk Decision and Policy — published by Routledge. [Started in 1996 to examine social science perspectives of risk of central importance to policy makers in business and government. This journal seems to be a useful resource for monitoring the academic discussions regarding risk and public policy. Both the Journal of Risk Research and Risk Decision and Policy would be useful to policy makers trying to stay abreast of recent thinking in risk management and policy.]

Risk: Health, Safety & Environment — the journal of the Risk Assessment and Policy Association. [A journal started in the early 1990s. Many articles from back issues are available online at www.fplc.edu/tfield/rskindx.htm]

Journal of Risk and Uncertainty — published by Kluwer Academic Publishers. [A more theoretical examination of decision making under uncertainty and risk. This journal is primarily useful for those interested in developing mathematical and theoretical models of risk.]

REFERENCES

- Canadian Centre for Management Development (CCMD). 2001. *Building trust: A foundation of risk management*. Action-Research Roundtable on Risk Management. Ottawa: Canadian Centre for Management Development.
- Canadian Standards Association (CSA). 1997. CAN/CSA-Q850-97 — *Risk management: Guideline for decision-makers*. Toronto: Canadian Standards Association.
- Fischhoff, B. 1995. Risk perception and communication unplugged: Twenty years of process. *Risk Analysis* 15(2): 137–45.
- Katzenbach, J. R. and D. K. Smith. 1993. *The wisdom of teams: Creating the high performance organization*. Boston: Harvard Business School Press.
- Leiss, W. in press. *In the chamber of risks: Understanding risk controversies*. Montreal: McGill-Queen's University Press. [Chapter 2 deals with the risk controversies surrounding genetically modified foods.]
- Marc, D. L. 1997. *Effective team leadership*. Banff: Banff Centre for Management.
- Morgan, G. 1997. *Images of organization*. Thousand Oaks, CA: Sage Publications.
- Powell, D. and W. Leiss. 1997. *Mad cows and mother's milk: The perils of poor risk communication*. Montreal: McGill-Queen's University Press.
- Privy Council Office (PCO). 2000. *Risk management in public policy*. Report of the Assistant Deputy Minister Working Group on Risk Management.. [Available online at www.pco-bcp.gc.ca/public_e.htm.]
- Sandman, P. M. 1993. *Responding to community outrage: Strategies for effective risk communication*. Fairfax, VA: American Industrial Hygiene Association.
- Senge, P. 1990. *The Fifth Discipline*. New York: Doubleday.
- Slovic, P. 1987. Perception of risk. *Science* 236: 280–85.
- . 1992. Perception of risk: Reflections on the psychometric paradigm. In *Social Theories of Risk*, ed. S. Krimsky and D. Golding. Westport, CT: Praeger Publishers.
- . 1999. Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis* 17(4): 689–701.
- Stanbury, W. T. 2000. Toward rationality in government's management of risks: Are we waiting for Godot? [Unpublished working paper submitted to CCMD Roundtable members.]
- Treasury Board Secretariat (TBS). 2001. *Integrated risk management framework*.
- United Nations. 1992. The Rio declaration on environment and development.
- Wildavsky, A. 1979. No risk is the highest risk of all. *American Scientist* 67 (1): (32–37).

Appendix A: Risk Management Frameworks

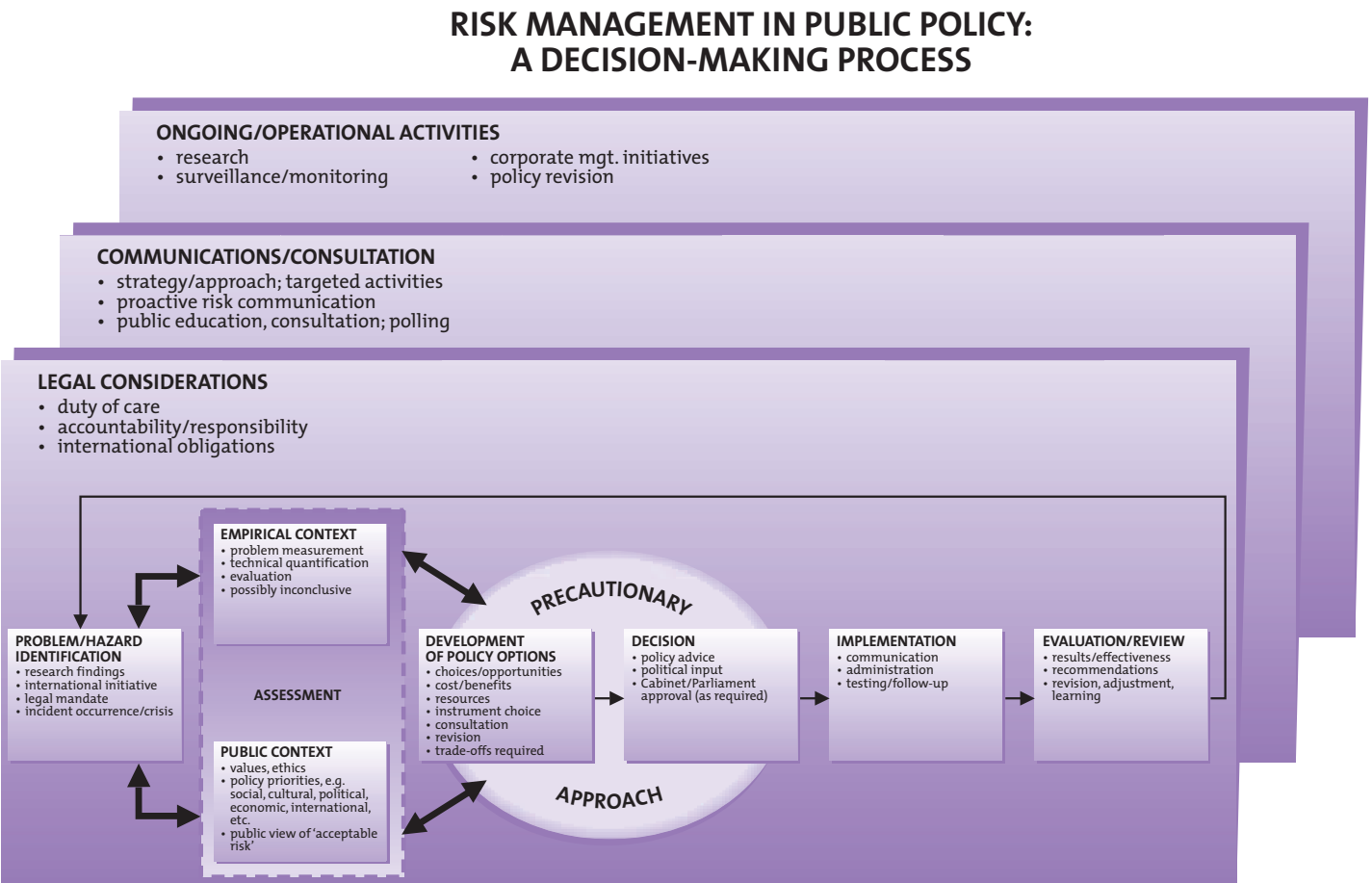
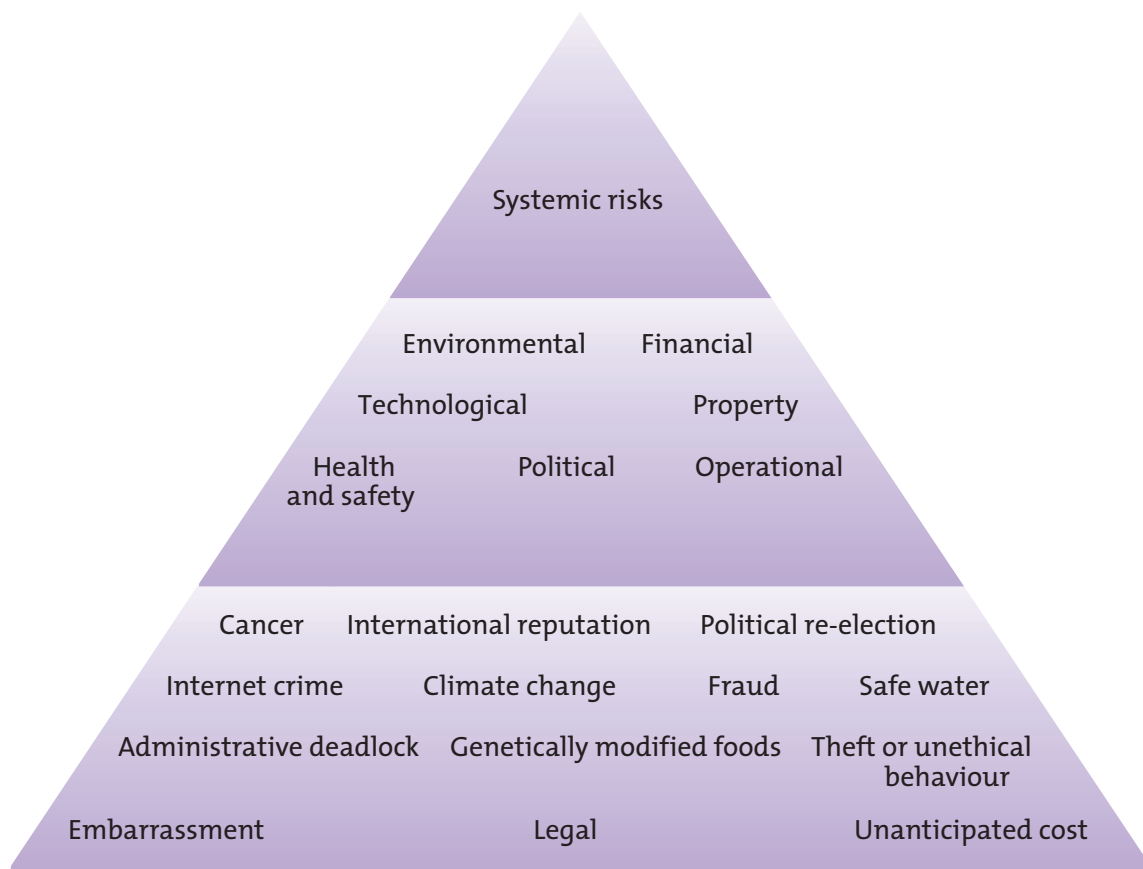


Figure 6. Risk management decision-making process for the public sector. Developed by the Assistant Deputy Minister Working Group on Risk Management (Privy Council Office 2000).



Figure 7. Common Risk Management Process shown in *Integrated Risk Management Framework* (TBS 2001)

Appendix B: Two Sample Risk Identification Lists



A hierarchy of possible risks. Cross-functional or interdisciplinary teams would be best suited to develop an inventory of potential risks in a holistic and comprehensive manner.

Appendix B: Two Sample Risk Identification Lists

A Sample of Risks Subject to Government Intervention (adapted from Stanbury 2000)

<p>Transportation</p> <ul style="list-style-type: none"> • Automobiles, motorcycles • Trucks • Railroads • Ships, barges, other watercraft • Pipelines (oil, gas, water, commodities) • Electricity (especially electromagnetic fields) 	<p>Economic or Financial</p> <p>(a) Related to financial instruments and institutions</p> <ul style="list-style-type: none"> • Securities (debt and equity) • Banking and other financial institutions • Insurance companies • Pension plans • Deposit insurance <p>(b) Related to purchase of products</p> <ul style="list-style-type: none"> • Product labelling, including trademarks • Weights and measures • Misleading advertising or marketing practices • Quality assurance (e.g., birth control devices) • Efficacy of professional services <p>(c) Related to income level and flow</p> <ul style="list-style-type: none"> • Employment insurance • Canada Pension Plan • Welfare payments • Worker's compensation • Crop insurance • Disaster relief (ad hoc)
<p>Environment</p> <ul style="list-style-type: none"> • Climate change • Air, water, land pollution (e.g., acid rain, urban smog, contaminated sites) • Forestry practices • Toxic substances • Biodiversity and endangered species • Fisheries • Ozone depletion <p>Natural Resources</p> <ul style="list-style-type: none"> • Access and use of renewable resources: fish, timber, water, wildlife • Access and use of non-renewable resources: petroleum, coal, natural gas, minerals 	<p>Human Safety</p> <p>(a) Infrastructure</p> <ul style="list-style-type: none"> • Dams, bridges, utility lines, roadways, pipelines <p>(b) Natural disasters</p> <ul style="list-style-type: none"> • Weather events (hurricane, tornado, floods, ice storms, blizzards, drought, avalanches) • Earthquakes • Forest or grassland fires
<p>Consumer Products</p> <ul style="list-style-type: none"> • Automobiles (e.g., seatbelts, airbags, bumpers, running lights, fuel standards) • Drugs (for humans and animals) • Medical devices • Children's toys, clothes, cribs, car seats, etc. • Explosives • Pleasure boats (e.g., Jet Ski) • Tires 	<p>Security</p> <p>(a) National security</p> <ul style="list-style-type: none"> • Defence against invasion or attack • Protection against subversion from within <p>(b) Personal security of citizens</p> <ul style="list-style-type: none"> • Police • Fire fighters
<p>Food</p> <ul style="list-style-type: none"> • Food contamination during production and distribution • Food labelling • Pesticide application and residuals in food • Bovine growth hormone in milk • Irradiation • Genetically modified foods 	<p>Rights</p> <ul style="list-style-type: none"> • Human rights (including the Charter) • Collective bargaining • Humane treatment of animals
<p>Technology</p> <ul style="list-style-type: none"> • Nuclear power • Biotechnology • Genetic engineering • Information technologies <p>Occupational</p> <ul style="list-style-type: none"> • Workplace safety 	

Appendix C: Some Factors Affecting the Perception of Risk

Important attributes affecting the perception of risk

Involuntary	A risk that is involuntarily imposed (e.g., building an industrial plant without community input) will be judged to be less acceptable than a risk that is voluntarily assumed (e.g., smoking).
Uncontrollable	The inability to control a risk decreases the judgment of its acceptability.
Industrial vs. natural	An industrial risk (e.g., nuclear power) is judged to be less acceptable than a natural risk (e.g., lightning strike).
Unfamiliar	An exotic or unfamiliar risk (e.g., biotechnology) is judged to be less acceptable than a familiar risk (e.g., household cleanser).
Memorable	A risk that is embedded in a remarkable event (e.g., airplane crash) is judged to be less acceptable than one that is not.
Dreaded	A risk that is highly feared (e.g., cancer) is judged to be less acceptable than one that is not (e.g., household accident).
Catastrophic	A catastrophic risk (e.g., airplane crash) is judged to be less acceptable than diffuse or cumulative risks (e.g., car accidents).
Unfair	If a risk is thought to be inequitably or unfairly placed upon a group, it will be judged as being less acceptable. This is particularly true if that group happens to be children.
Untrustworthy	If the source of the risk is untrustworthy, the risk will be judged to be less acceptable.
Uncertain	A risk that has high uncertainty and that we know little about is judged to be less acceptable than one that is not.
Immoral	A risk that is deemed to be unethical or immoral is judged to be less acceptable than one that is not.

Source: Sandman 1993

Appendix D: Precautionary Approach Definition

The precautionary principle was defined in Principle 15 of the Rio Declaration (UN 1992): "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." The precautionary approach is an attempt to acknowledge and address uncertainty and complexity when there is a need to make a decision about a potential risk of serious or irreversible harm. While interpretations of the approach vary depending upon the circumstances, it involves some notion of erring on the side of caution when decisions must be made without the benefit of complete scientific knowledge.

At the time of writing, the Government of Canada continues to work on improving its understanding of the precautionary approach. This work should culminate in a published report on some guiding principles of a precautionary approach. Readers can find out more about this work through Hélène Quesnel in the Privy Council Office, hquesnel@pco-bcp.gc.ca.

