The Federal All Hazards Risk Assessment Framework Body of Knowledge

Volume1: Establishing an Information Baseline and Way Forward

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IMPORTANT INFORMATIVE STATEMENTS

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Abstract

Public Safety (PS) Canada and Defence Research & Development Canada's (DRDC) Centre for Security Science (CSS) are in the process of investigating improvements to the federal All Hazards Risk Assessment (AHRA) methodology that would enable the federal government to develop a national picture of high priority risks and capabilities that mitigate those risks.

The primary objective of this report is to establish an information baseline that can support exploitation of the AHRA work to date. A secondary objective is to identify challenges and opportunities to improve the AHRA methodology and techniques, and to support decisions related to continued federal work and/or the transition to a NRA concept. This Technical Report (TR) is intended for participants in the federal AHRA initiative, and for a wider audience involved in safety, security, societal resilience and emergency risk management. The report highlights lessons from the federal AHRA approach that would support multi-mandate and multi-jurisdictional risk assessments, and enable the development of a national risk assessment (NRA).

A possible concept of operations is that regional authorities, supported by federal specialists (and preferably funding) implement a series of workshops focused on regional high risk scenarios. The outputs of these workshops would include regional risk profiles that would be merged into a national picture of risk exposure, regional best practices including in the area of critical infrastructure and international collaboration, and strategic opportunities to improve investment decision making. Also, the AHRA should merge with a capability assessment methodology, and the federal government and regional stakeholders should produce the documentation, and develop the mechanisms and support systems to promote and sustain collaboration

Résumé

Sécurité publique Canada (SP) et le Centre des sciences de la sécurité de Recherche et développement pour la défense Canada (RDDC CSS) examinent actuellement les améliorations pouvant être apportées à la méthodologie d'évaluation tous risques (ETR) du gouvernement du Canada afin que ce dernier brosse un portait des principaux risques et des capacités atténuant ceux-ci à l'échelle nationale.

Le présent rapport vise avant tout à établir une base de données soutenant l'exploitation des travaux d'ETR à ce jour. Il a également comme objectif de cerner les problèmes et les possibilités liés à l'amélioration des techniques et de la méthodologie d'ETR, ainsi qu'à l'appui à la prise de décisions concernant les opérations fédérales continues ou la transition vers un concept d'évaluation nationale des risques (ENR). Ce rapport technique (RT) est destiné aux gens participant à l'initiative fédérale d'ETR, de même qu'à un plus large public associé à la sûreté, la sécurité, la résilience sociétale et la gestion des risques en situation d'urgence. Le rapport souligne les leçons tirées de l'approche fédérale d'ETR pouvant soutenir des évaluations de risque touchant plusieurs mandats et compétences, et permettant l'élaboration d'une ENR.

Un concept possible des opérations est que des autorités régionales, soutenues par des spécialistes fédéraux (et préférablement financées par le gouvernement fédéral), mettent en œuvre une série d'ateliers axés sur des scénarios régionaux de risque élevé. Les résultats de ces ateliers comprendraient des profils régionaux de risque qui, une fois réunit, brosseraient un portrait de l'exposition aux risques à l'échelle nationale, des meilleures pratiques régionales (y compris dans le domaine de l'infrastructure essentielle et de la collaboration internationale) et des possibilités stratégiques d'amélioration du processus décisionnel relatif aux investissements. En outre, l'ETR devrait être combinée à une méthodologie d'évaluation des capacités. Le gouvernement fédéral et les intervenants régionaux devraient produire la documentation et élaborer les mécanismes et les systèmes de soutien visant à promouvoir et à maintenir la collaboration.

Executive summary

The Federal All Hazards Risk Assessment Framework Body of Knowledge: Volume1: Establishing an Information Baseline and Way Forward

Ian Bayne; Jim Duncan; Brad Mills; Shaye Friesen; Alain Goudreau; DRDC CSS TR 2013-014; Defence Research and Development Canada – CSS; September 2013.

Introduction: Public Safety (PS) Canada and Defence Research & Development Canada's (DRDC) Centre for Security Science (CSS) are investigating improvements to the federal All Hazards Risk Assessment (AHRA) that would enable the federal authority to develop a national picture of high priority risks and the regional capabilities that mitigate those risks. Federal departments have contributed to the AHRA body of work since 2006. Within DRDC CSS alone, information concerning the AHRA resides in over 1500 documents. In 2012, DRDC CSS initiated a Targeted Investment (TI) Project, the AHRA Transition Project, which includes the review of historical documents, and the creation of an information baseline that is intended to support future PS and DRDC CSS decisions on the federal AHRA activity, and the Canadian Safety and Security Program (CSSP).

This Technical Report (TR) establishes an information baseline for the federal AHRA that spans the 2006-2012+ timeframe, and presents ideas to overcome the challenges facing the development of a national risk assessment (NRA) concept. It is intended for participants engaged in the federal AHRA initiative, and for a wider audience involved in safety, security, societal resilience and emergency risk management. Several core foundational elements that enabled the AHRA framework using a multi-year 'spiral development' effort - including the lexicon, community mapping, taxonomy and methodology - are analyzed as part of this report. This report goes beyond documenting and describing the AHRA, and proposes a number of changes that, if accepted, should improve the ability of PS Canada and DRDC CSS to initiate and sustain a comprehensive, unified and tailored NRA model that incorporates regional dimensions of risk, validated federal government scenarios, and supports convergence with a capability assessment methodology, and the PS work on a National Cross-Sector Profile.

Results: The output of this review includes an AHRA information baseline that spans the 2006-2012+ timeframe, and presents ideas to exploit the federal body of work to improve the federal process and to manage the transition to a streamlined national concept. A national concept should focus on the high priority risks from the regions' perspectives because this is where the most relevant information and knowledge reside. A regional approach would support a national body of knowledge and collaborative environment, using modern information and communications technology. The proposed BoK way forward is that regional authorities, supported by federal specialists (and preferably funding) implement a series of workshops focused on regional high risk scenarios. This series of scenario-based workshops would combine specialists', operations managers' and asset owners', and executives' perspectives to gain insight into the risks, capability gaps and investment alternatives. The outputs of these workshops would include regional risk profiles that would be compared and merged into a national picture of risk exposure, regional best

practices, including critical infrastructure (sector risk profiles), and strategic opportunities to improve investment decision making on all levels of government and among other stakeholders.

Significance: This report establishes a first 'body of knowledge' in all-hazards risk assessment and risk management for DRDC CSS. The application of AHRA experience, in combination with lessons from existing federal, regional, science and technology (S&T), academia and international partners' should enable a flexible NRA approach that expands the knowledgebase, and helps achieve a better balance of safety, security and societal resilience investments.

Future plans: This report describes a way forward that includes a phased implementation strategy and transition plan. An exploitation concept includes suggestions to transition towards a national framework that overcomes known challenges and systemic constraints. One suggestion is that AHRA should merge or align with a broader capability assessment methodology that helps specialists, operational managers and executives focus on high priority risks and therefore, capability gaps, from regional, national and continental perspectives. The federal government and regional stakeholders, should produce the NRA documentation, and develop the mechanisms and support systems to sustain collaboration.

Sommaire

The Federal All Hazards Risk Assessment Framework Body of Knowledge: Volume1: Establishing an Information Baseline and Way Forward

Ian Bayne; Jim Duncan; Brad Mills; Shaye Friesen; Alain Goudreau ; DRDC CSS TR 2013-014 ; Recherche et développement pour la défense Canada – CSS; septembre 2013.

Introduction : Sécurité publique Canada (SP) et le Centre des sciences de la sécurité de Recherche et développement pour la défense Canada (RDDC CSS) examinent les améliorations pouvant être apportées à l'évaluation tous risques (ETR) du gouvernement fédéral afin que ce dernier brosse un portait des principaux risques à l'échelle nationale et des capacités régionales atténuant ces risques. Les ministères fédéraux participent aux travaux d'ETR depuis 2006. Au sein de RDDC CSS seulement, plus de 1 500 documents comportent des renseignements sur l'ETR. En 2012, RDDC CSS a lancé le Projet de transition de l'ETR, un projet d'investissement ciblé incluant l'examen de documents historiques et la création d'une base de données pour appuyer la prise de décisions futures du centre et de SP à propos de l'ETR du gouvernement fédéral et du Programme canadien de sûreté et de sécurité (PCSS).

Le présent rapport technique établit une base de données d'ETR fédérale comprenant des renseignements de 2006 à 2012 et des années ultérieures. Il soumet également des idées pour surmonter les problèmes concernant l'élaboration d'un concept d'évaluation national des risques (ENR). Il est destiné aux gens participant à l'initiative d'ETR, de même qu'à un large public associé à la sûreté, la sécurité, la résilience sociétale et la gestion des risques en situation d'urgence. De nombreux éléments de base mettant en œuvre le cadre d'ETR grâce à un processus d'élaboration graduelle échelonnée sur plusieurs années (y compris le lexique, le profil de la communauté, la taxinomie et la méthodologie) sont analysés. Ce document va au-delà de la documentation et de la description de l'ETR. Il propose divers changements qui amélioreraient la capacité de SP et RDDC CSS à établir et à maintenir un modèle d'ENR complet, unifié et adapté. Ce modèle inclurait des aspects régionaux du risque et des scénarios possibles du gouvernement fédéral, en plus d'appuyer la convergence avec une méthodologie d'évaluation des capacités et le travail de SP sur le profil national intersectoriel.

Résultats : Les résultats du présent examen comportent une base de données d'ETR comprenant des renseignements de 2006 à 2012 et des années ultérieures. Un concept national devrait être axé sur les principaux risques du point de vue des régions où l'information est la plus pertinente et où les connaissances se trouvent. Une approche régionale devrait appuyer une base de connaissance et un environnement de collaboration à l'échelle nationale grâce à une technologie moderne de l'information et des communications. Les prochaines étapes possibles concernant les connaissances sont que des autorités régionales, soutenues par des spécialistes fédéraux (et préférablement financées), mettent en œuvre une série d'ateliers axés sur des scénarios régionaux de risque élevé. Ces ateliers combineraient les perspectives de spécialistes, de gestionnaires des opérations, de propriétaires et de cadres supérieurs afin d'avoir une idée du risque, des lacunes en matière de capacités et des possibilités d'investissement. Les résultats de

ces ateliers comprendraient des profils régionaux du risque qui, une fois réunis, brosseraient un portrait de l'exposition aux risques à l'échelle nationale, des meilleures pratiques régionales (y compris l'infrastructure essentielle – profils de risque des secteurs) et des possibilités stratégiques d'amélioration du processus décisionnel à tous les paliers du gouvernement et parmi les autres intervenants.

Important : Le présent rapport établit les principales « connaissances » de RDDC CSS en matière d'évaluation tous risques et de gestion du risque. Combinée aux leçons retenues par les collaborateurs du gouvernement fédéral, des régions, des sciences et de la technologie, du milieu universitaire et de l'étranger, la mise en application de l'expérience d'ETR devrait permettre l'élaboration d'une approche d'ENR souple élargissant la base de connaissance du secteur, en plus d'atteindre un meilleur équilibre des investissements de la sûreté, de la sécurité et de la résilience sociétale.

Travaux futurs : Le présent document décrit une voie à suivre qui comprend une stratégie de mise en œuvre progressive et un plan de transition. Un concept d'exploitation inclut des propositions de transition vers un cadre national surmontant les problèmes et les obstacles connus. Il est proposé que l'ETR soit combinée ou harmonisée à une méthodologie élargie d'évaluation des capacités permettant aux spécialistes, aux gestionnaires des opérations et au cadre supérieur de se concentrer sur les principaux risques, ainsi que sur les lacunes en matière de capacités d'un point de vue régional, national et continental. Le gouvernement fédéral et les intervenants régionaux devraient produire la documentation relative à l'ENR et élaborer les mécanismes et les systèmes de soutien visant à maintenir la collaboration.

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Introduction

1.1   Purpose

This Technical Report (TR), the All Hazards Risk Assessment (AHRA) Body of Knowledge (BoK), presents an information baseline of the AHRA framework conducted by Public Safety Canada (PS) and Defence Research & Development Canada's (DRDC) Centre for Security Science (CSS) in collaboration with participating federal institutions in the 2006 to 2012 timeframe, up to and including the implementation of the AHRA Methodology Guidelines.[1] The information baseline is intended to support the advancement of the federal AHRA activity and potentially, a strategic national risk assessment (NRA) activity. This report is one element of a larger DRDC CSS Targeted Investment (TI) project, the AHRA Transition Project.[2]

This report illustrates the potential value of leveraging the best practices of diverse risk assessment activities across jurisdictions and critical infrastructure sectors. It also identifies alternatives to exploit this knowledge base, and to promote science and technology (S&T) and academic support to the area of risk assessment and risk management. This report reflects an awareness of the importance of preserving corporate scientific memory, ultimately serving as a compendium that encourages future development of well-researched, methodologically-sound and analytically-robust risk assessment practices in support of decision-makers at all levels of government and throughout society.

The Risk & Capability Integration (RACI) Section within DRDC CSS has not completed a study of this type before. This report is an in-depth examination of the AHRA based on an examination of its documentation, tracing its conceptual origins through to maturation and eventual implementation across federal departments. However, this study is representative in the sense that a 'real' AHRA BoK would involve gathering feedback from participants from other government departments (OGDs) concerning the efficiency and effectiveness of developing and using scenarios in risk prioritization workshops, the level of comprehension of the methodology, the adaptability of the AHRA framework and techniques to departmental assessments, and perspectives from the users of the outputs of the risk assessment process (i.e., especially senior decision-makers). Consequently, this report represents a first effort to establish an information baseline for the federal AHRA and the way forward.

It is intended that the reader can refer to any section or read the whole document to gain a better understanding of the federal AHRA activity. A separate volume contains additional supporting material. The report supports several Canadian Safety and Security Program (CSSP) Strategic Outcomes,[3] and considers the role of risk assessments in the broader portfolio of national

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[1] Canada, *AHRA Methodology Guidelines 2011-2012* (Ottawa: Public Safety Canada, 2012).
[2] See Project Charter, AHRA Transition Project, CSSP-2012-TI-1108, 10 September 2012 The Transition Project (2012-14) has three inter-related parts – this body of knowledge study, automation of risk assessment tools, and capability assessment methodology.
[3] Specifically, this report addresses the following CSSP Immediate Outcomes: 1c – The Federal All-Hazards Risk Assessment is methodologically robust and implementable, and 2a – Integrated risk and capability gap assessment models guides investment in public safety and security S&T.

activities, in particular the desire to transition to a NRA, and the work on the National Security Program and development of a National Cross-Sector Risk Profile

1.2   Provenance

This report is consistent with the themes articulated in the CSSP Strategic Planning Guidance (SPG) for 2013/14, and the Memorandum of Understanding (MOU) between PS and the Department of National Defence (DND) for collaboration in S&T, to support public safety and national security strategic objectives. The information described in this document is based on the work of the AHRA framework interdepartmental working groups. New ideas are presented as an input to the review of the AHRA Methodology Guidelines (PS, 2012), and other federal policy and guidance documents.[4]

1.3   Background

In the fall of 2006, the Royal Canadian Mounted Police (RCMP) Critical Incident Preparedness and Response (CIPAR) Integrated Risk Management Report identified the need for the AHRA for the Government of Canada (GC). In parallel, the DND operational headquarters responsible for domestic security, Canada Command (Canada COM), had at the time identified this requirement. It was felt at the time that a comprehensive AHRA methodology would assist federal policy makers in assessing the federal government's ability to respond to any type of threat or hazard. It would also aid in identifying priorities and strategies for personnel, training and equipment requirements that would support domestic security agencies and their requirements.

In 2006, the Intelligence Assessment Coordination Committee (IACC)[5] set up the Intelligence Experts Group (IEG) on Domestic Security to improve the sharing of intelligence on domestic threats and to produce collaborative assessments. The group included participants from 18 federal departments and agencies. DND and RCMP co-chaired the group. The IACC requested that an AHRA that would inform senior federal government decision-makers in the areas of funding, learning and development, resource allocation and threat assessment.

In January 2007, DRDC CSS agreed to provide S&T oversight and project management support to the IEG initiative. In the 2007-08 timeframe, the IEG developed the AHRA threat lexicon and taxonomy. The group also developed an initial horizontal view of participating departments' risk assessment capabilities. A consensus emerged that an AHRA framework and risk assessment technique should help to address the following challenges:

- No common methodology and techniques to develop a whole-of-government approach to risk assessment and investment prioritization;

- Inconsistencies in existing security risk assessment approaches that made it difficult to compare assessments across federal institutions and mandates;

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[4] List of documents with extracts of risk assessment quotes are in Volume II.
[5] Interdepartmental coordinating body for the Canadian Security and Intelligence (S&I) community, chaired by the head of the Privy Council Office (PCO), International Assessment Staff (IAS) Secretariat.

- Limited processes to support federal collaboration with other jurisdictions and critical infrastructure sectors;

- Interdependencies across mandates, that were not well understood, which could obscure significant risks; and

- Federal institutions had varying levels of risk assessment capability maturity and they were interpreting risks from an institutional not a national perspective.

By February 2009, the all hazards scope of the project had exceeded the original mandate, and the IEG sought guidance from the Assistant Deputy Minister (ADM) Emergency Management Committee (EMC). ADM EMC directed that an AHRA Interdepartmental Working Group be formed to consider three questions:[6]

- Is there a need for federal AHRA framework?

- If so, what would be the nature, scope and dimension of this framework?

- How would experts play a role in moving this framework forward? [7]

Figure 1 illustrates the federal AHRA timeline, including key decision points on next steps for further exploiting the AHRA.

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[6] See Presentation to ADM EMC, 16 Nov 2009
[7] The AHRA Interdepartmental Working Group (IWG) terms of reference identified the following "high level" objectives (Volume II, Folio 6):
- Capture risks that are high enough that they may become of national interest;
- Become aware of risks that may not be of national concern at the time, but that are just under the radar scan;
- Be aware of the risks that are not of national concern, but ensuring that they are monitored; and
- Monitor the changes in risks over time.
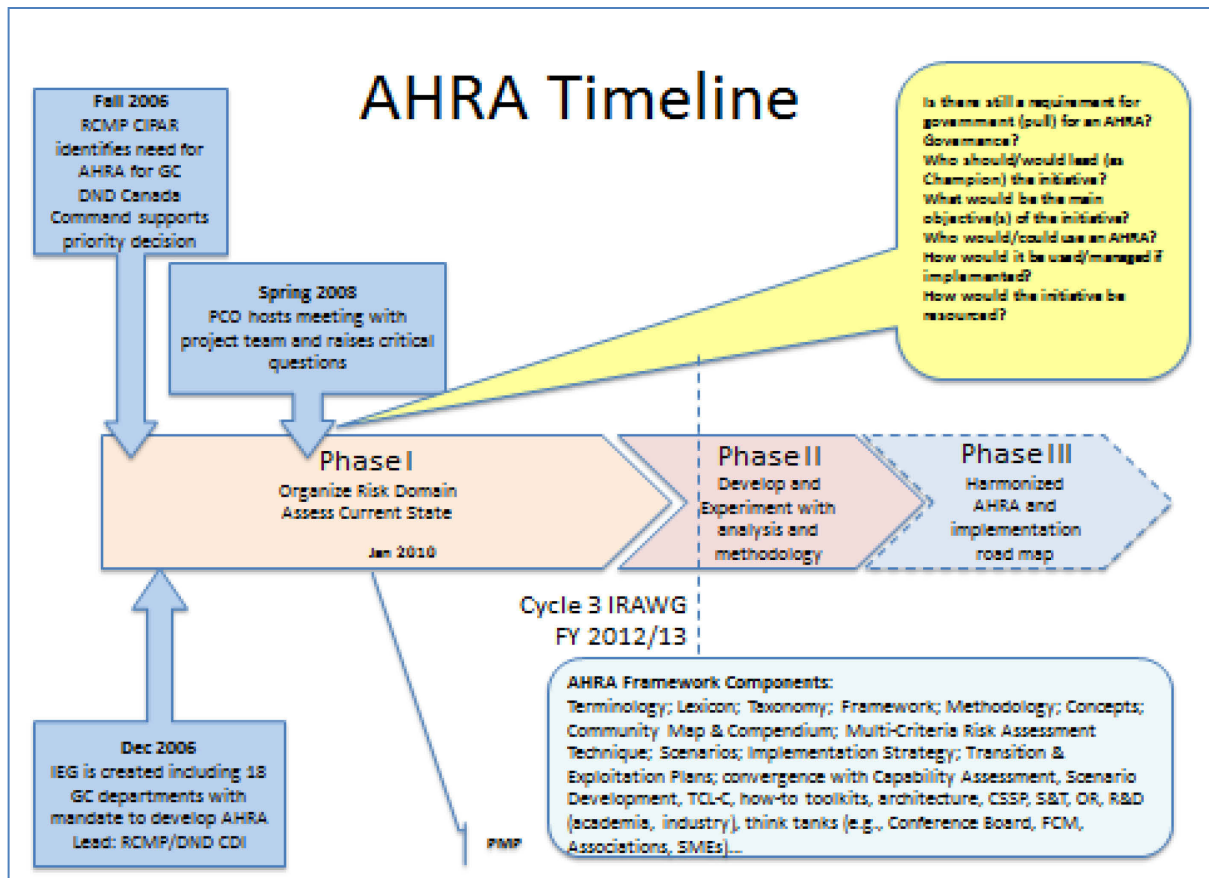
Figure 1: AHRA Pilot Project Timeline

In parallel with the AHRA work, the federal GC was developing several national strategies and actions plans related to its responsibilities under the *Emergency Management Act (EMA)*. Many of these documents explicitly mention applying an all hazards risk assessment approach.[8] The timeline below illustrates some of the milestones involved in this process, with a focus on PS and CSS efforts. The timeline includes an anticipated decision on the way forward for both organizations and the federal stakeholders in the next 1-3 years.

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[8] A list of EM references with risk-related quotes is included in Volume II.
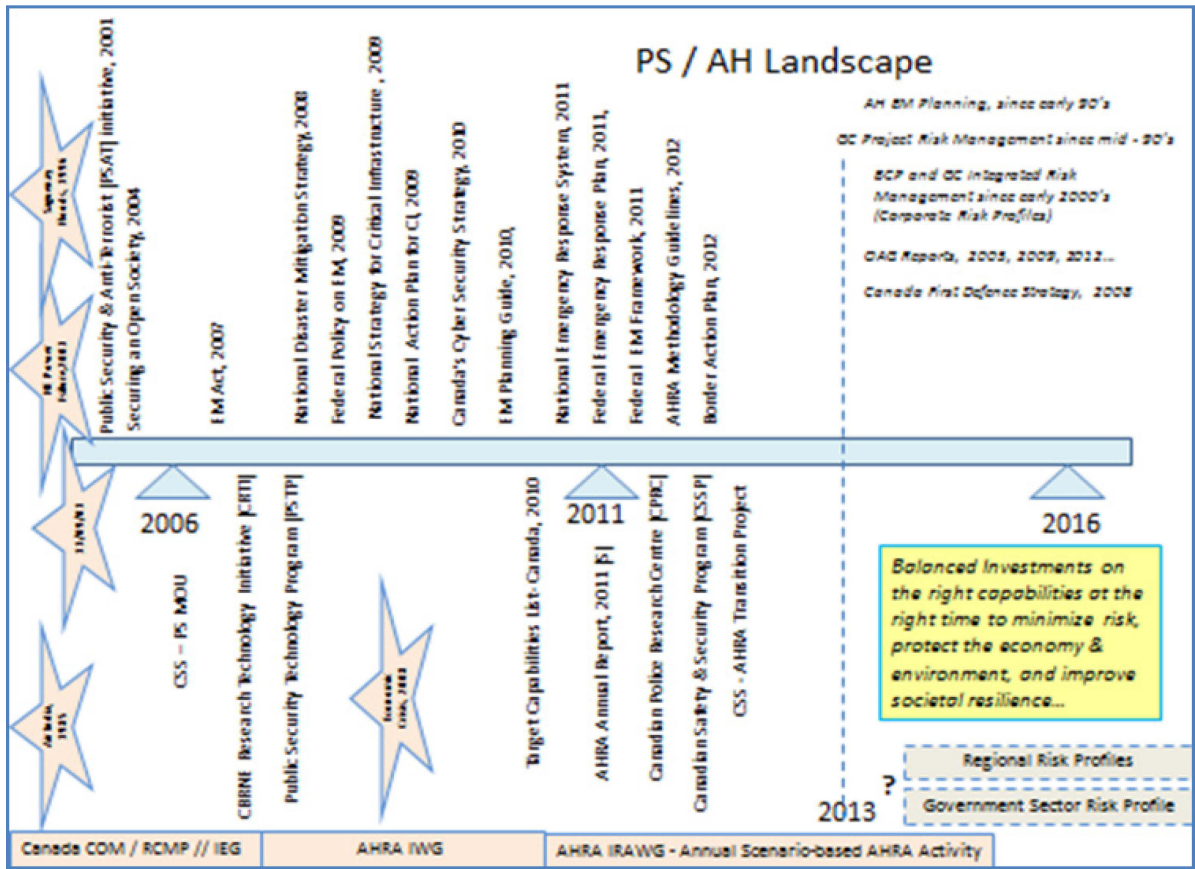
Figure 2: Safety & Security Initiatives – AHRA Timeline

1.4 Objectives

The primary objective of this report is to establish an information baseline that can support exploitation of the AHRA work to date. A secondary objective is to identify challenges and opportunities to improve the AHRA methodology and techniques, and to support decisions related to continued federal work and/or the transition to a NRA concept. The scope of this report includes a review of DRDC CSS documentation and the PS AHRA Methodology Guidelines, published in 2012.

1.5 Scope

The project scope focused on a review of CSS documentation and consultation with CSS scientists who supported the development of the AHRA methodology and techniques. It did not include consultation with other departments or PS. The analysis included a preliminary review of other nations' programs and the existing standards and best practices. The analysis did not include a search of academic literature on risk assessment or risk management, although a few references have been included (e.g., Chapter 2, Section 2.3.1).

1.6   Challenges

A major challenge with compiling an AHRA information baseline is to achieve a reasonable balance between highlighting relevant historical information, and providing new insight to sustain and exploit the body of knowledge.

1.7   Approach

The approach used for researching, writing and analyzing content for this report consisted of the following six steps: initiate project; scope and plan the project by developing a 'writing guide'; gather and analyze the documentation; develop a draft report; validate and refine the report; and finalize report. The methodology used for writing this report is described in more detail in Volume II, Folio 4.

The writing team that compiled this report considered the following reference points for developing information baselines: the Project Management Institute's Project Management Body of Knowledge (PMBoK, 2012); the Risk Management Institute of Australia (RMIA) Security Risk Management BoK (SRMBoK, 2009); the Department of Homeland Security's (DHS) Information Technology (IT) Security Essential Body of Knowledge (EBK, 2008); and the CERT Resilience Management Model (CERT-RMM, 2011).[9] The team did not perform an in-depth review of academic research, although some references are included.

The documentation related to the federal AHRA contained within the DRDC CSS electronic file archives consisted of over 1500 documents in a variety of formats that were transferred to a CD-ROM. The project team experimented with information and knowledge management (IKM) tool (i.e., *CiriLab Organizer*) and a mind mapping tool (i.e., *MindJet*) as a way of sorting and organizing the information to streamline the literature review. The team identified and segregated duplicates, mapped products to a theme-based taxonomy, and compared the taxonomy to the intuitive modules described in the Statement of Work (Volume II, Folio 4). By using the *CiriLab* tool, the team identified 652 relevant documents that became the principle library. Some other references were consulted, and best efforts were made to cite and reference these resources to supplement the resources that were made available by DRDC CSS.

1.8   Report Organization and Structure

This volume describes the historical perspective and presents new ideas to support decision regarding future work. It is intended that chapters can be read individually or as a complete body of work. Volume I sections are as follows:

- Section 1 - Introduction: Describes the origin of the AHRA activity from 2006 until 2012, when PS published the AHRA Methodology Guidelines (PS, 2012). It presents two timelines – AHRA and the relationship of AHRA to other PS initiatives that rely on risk assessments;

- Section 2 – Concept-based Approach: This section describes the concept-based approach that suspends judgment on the outcome and focuses forward. It supports a level of

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[9] See bibliography for citations.

experimentation, and it tolerates missteps on the way to a practical, relevant and sustainable approach;

- Section 3 – Governance: This section compares the federal governance structure to a more flexible and participative approach that envisages that regional authorities are responsible for governance, supported by federal subject matter experts and stakeholder department executives;

- Section 4 – AHRA Foundational Building Blocks: Describes the lexicon, taxonomy and community mapping processes and their relevance to a NRA;

- Section 5 – AHRA Framework: This chapter is based primarily on the Public Safety AHRA Methodology Guidelines (2012). It includes suggestions to augment and/or improve the methodology and guidelines for a federal process;

- Section 6 - Architecture: Summarizes the application of architecture frameworks, to provide a structured process and automation support for gaining insight into the federal risk assessment capability;

- Section 7 – Implementation Strategy: Building on the AHRA approach, this section presents a work breakdown structure and recommendations to support design, development and implementation of a NRA concept and/or the advancement of risk assessment practices in GC;

- Section 8 – Transition Plan: This plan focuses on near-term activities including: convergence with other aspects of the AHRA Transition Project, in particular, capability assessment; and expanding the knowledge base to support decisions on the NRA and CSSP; and

- Section 9 – Exploitation Concept: This chapter describes a concept-based approach that focuses on opportunities to improve the chances of success of a NRA activity.

Supporting material and relevant documents are held by DRDC CSS.

Volume II includes the following sections:

- Folio 1 - Acronyms

- Folio 2 - AHRA program references (representative)

- Folio 3 - Canadian EM references that mention risk assessment

- Folio 4 - Body of Knowledge Methodology (Project Statement of Work enclosed)

- Folio 5 - Additional figures

- Folio 6 - Terms of reference

- Folio 7 - International benchmarking

- Folio 8 - Standards

- Folio 9 - Risk assessment techniques & tools (As-Is AHRA Compendium)

- Folio 10 - Preliminary option analysis (National Risk Assessment)

- Folio 11 - Architecture Products (To be added after AHRA IRAWG Cycle 3)

- Folio 12 - Project management tools

- Folio 13 - A Holistic, Cross-Government All Hazards Risk Assessment (paper)

2 Concept-based Approach

2.1 Purpose

This section describes the concept-based approach that was used for developing the AHRA framework. It summarizes the main challenges, assumptions and principles that continue to influence the AHRA work. This section will be relevant for PS and the CSSP communities engaged in conceiving, building and designing policies, implementing risk assessments, and for supporting decisions on the direction of future risk assessment work.

2.2 Concept-based Approach

The conceptual approach behind the AHRA was based on an examination of policies, federal and departmental risk programs and whole-of-government initiatives that employ risk assessments as an integral part of decision making. A nine-stage, spiral development strategy was employed to focus the work program on practical deliverables within reasonable timeframes to be able to address ADM EMC questions and to maintain momentum. The four stages of 'building a model' are described in this section.[10]

2.2.1 State the Problem and Define the Objectives

The original DRDC CSS AHRA framework Project Implementation Plan (PIP) described the AHRA vision as having two purposes: (1) "to inform central agencies in order to support government resource allocation and policy development; to provide information to other jurisdictional authorities and sectors; and (2) to assist federal departments and agencies with planning, operations and coordination across jurisdictional boundaries."[11] This approach built on the capability assessment methodology that suspends judgement on the identification of outcomes, preferred alternatives or solutions too early in the development cycle.

Such problems, at least at that time, included the lack of common terminology and tools to support collaboration and information sharing. Therefore, the project team initiated early work on developing a lexicon and taxonomy to overcome these challenges. The goal was not to produce the perfect tools, but to establish common terms that were sufficient to support further work. Initially, objectives were short-term and focused on producing outputs that would be useful for the group and individual participants. Every effort was made to leverage participants' knowledge and diverse experience.

There was also an expectation recognized early on in the development of the AHRA that the work would also support a future decision on a NRA activity   The AHRA problem definition was informed by considering similar initiatives in other nations (e.g., United States, United Kingdom, the Netherlands, Australia, New Zealand). The objectives that emerged were:

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[10] AHRA - A Framework Approach, Presentation (A. Goudreau, Manager RACI; S. Friesen, Risk Analyst), CSS, October 2012.
[11] AHRA Project Implementation Plan, Ottawa, Centre for Security Science, Version 1, 2007, p. 2.

- To help specialists and non-specialists produce consistent risk assessments that are comprehensive, verifiable, scalable and relevant to their organizations and mandates;

- To develop insight into risk assessment methodologies and techniques;

- To gain insight into risks of national significance, and existing capabilities to prioritize and treat those risks; and

- To improve the knowledge of risk sciences.

2.2.2   Formulate the Approach

In collaboration with PS Canada staff and department participants, DRDC CSS formulated an approach that considered lessons from other S&T and programmatic initiatives, including: the Consolidated Risk Assessment (CRA) technique that was being applied to assess chemical, biological, radiological/nuclear and explosives (CBRNE) hazards and security threat assessments; work on the Canadian Risk and Hazards Network (CRHNet); Operational Research (OR) work on criticality assessments and support to major events planning (e.g., 2010 Winter Olympics, G8, G20); and emergency management capability assessment work at the local and regional levels (e.g., resource typing, the Targeted Capabilities List-Canadian (TCL-C); Hard Problems List; and futures and architecture framework support to other initiatives).

The scope was managed carefully to avoid problems with handling classified and sensitive information in the development phase or delving into risk treatment. As one subject matter expert on the AHRA pointed out, "the AHRA process and methodology are focused primarily on the assessment component of the overall risk management paradigm. The hazard risk domain is covered by the AHRA methodology. However, the strategic risk domain (e.g., political risks) and the operational risk domain (e.g., day-to-day issues confronting the institution) are not, although these aspects may be considered and factored in assigning impact ratings."[12] It is noted that the AHRA work has since evolved considerably, and that some of these elements are being now explicitly or implicitly being considered by: engagement of senior management in selecting and prioritizing scenarios; the practice of having lead departments facilitate the scenario-based risk assessments; and the exploration of techniques such as the description of impact thresholds as exemplified in the concept of 'nominal' scenarios and variants that explore the boundaries around extreme consequence low likelihood, and high likelihood low consequence.

The approach was based on several critical assumptions, including:

- **Commitment of Partners** - There would be sufficient voluntary participation in the working groups to gather information from the participating organizations that would lead to a reasonable, validated methodology, and a preliminary set of tools that could be further developed and adapted to different risk assessment applications;

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[12] Interview with Simona Verga, DRDC CSS, Decision Support Section / Operational Research Team, December 2012.

- **Senior Leadership 'Buy-In'** – Consultation and building consensus and 'buy-in' from senior leadership was a necessary pre-condition for the successful implementation of the ARHRA;

- **Spiral Development Approach** - If ADM EMC did not support the further development of the AHRA after the pilot project, and a 'no-go' decision was made to cancel the initiative, the project team deemed it necessary to develop useful outputs that would contribute to other activities including new ways of thinking about, and planning for, whole-of-government (WoG) emergency management capabilities.[13] Thus, even if the original work on developing and implementing a federal AHRA had failed, the project team would still succeed in delivering a series of reports that documented and described their efforts;

- **Linkage to Emergency Management** - There was reasonable confidence that the AHRA could evolve into a methodology and toolset that could be linked and combined with other emergency planning, management and coordination activities, such as the capability-based investment model (CBIM), TCL-C, and regional emergency management system integration initiatives; and

- **Availability of Subject Matter Experts** - There was sufficient time and expertise within DRDC CSS (and PS) to explore the application of scenario management frameworks, OR techniques in looking at expert elicitation and pairwise comparison involving the calibration process, and architecture frameworks (AF).

From this, several guiding principles emerged to shape the ARHA management framework, including:

- **Collaboration -** The AHRA pilot project was a voluntary collaborative effort that leveraged the experience of a diverse community of federal policy specialists, risk practitioners, security and intelligence, and scientists. It was implemented in a way that would exploit 'quick wins' to keep people engaged. The AHRA did not dictate the threats, risks, and hazards or priorities to federal departments. On the contrary. Federal departmental representatives were experts in their domain, and in some cases many already had an operational role or organizational mandate for response. The AHRA provided a unified framework in which other federal departments populated with their list of 'hard problems' (e.g., threats/hazards), including templates for planning scenarios, common criteria/rating scales, and visualization techniques that enabled comparison of risks across multiple departments and risk domains.

- **Agile Project Management -** One of the defining features of the AHRA concept of was that the products were developed iteratively. Forethought was given to identifying tasks, deliverables and priorities for further development. Basing the AHRA on the production of a single report at the end of the project life cycle was not practical or useful to the participants; and

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[13] AHRA was an input to development of the Emergency Management Planning Guide (EMPG, 2010).

- **Universality -** It was hoped that the AHRA framework would achieve a degree of universality, so that risk practitioners could implement and/or adapt the framework to augment their existing practices. It was felt that by using similar, if not common, techniques, people would be better prepared to communicate and justify the outcomes of their risk assessment efforts to diverse audiences. Furthermore, it was hoped that a more comprehensive risk assessment approach would enable decision makers to have more confidence in the assessments and to provide better guidance to specialists and managers. Such an approach could then serve as a 'launch-pad' for the development of an NRA or national risk register in Canada.

2.2.3 Collect Data / Interview Experts

The AHRA project team gathered information from participating departments (see Table 1) using questionnaires and interviews with subject matter experts (SME). A community mapping activity compared information from departments horizontally.

Table 1: AHRA Project Participants

Aboriginal Affairs & Northern Development Canada	Foreign Affairs & International Trade Canada
Agriculture and Agri-Food Canada	Health Canada
Canada Border Services Agency	Human Resources and Skills Development Canada
Canada Revenue Agency	Industry Canada
Canadian Food Inspection Agency	Natural Resources Canada
Canadian Nuclear Safety Commission	Privy Council Office (Co-Chair)
Canadian Security Intelligence Service	Public Health Agency of Canada
Citizenship & Immigration Canada	Public Safety Canada (Co-Chair)
Correctional Services Canada	Public Works & Government Services Canada
Defence R&D Canada (Centre for Security Science)	RCMP
DND Canada Command	Transport Canada
Environment Canada	Treasury Board Secretariat

2.2.4 Build the model

As stated in a recent paper by one subject matter expert who was intimately involved in the AHRA, "the purpose of the AHRA was to enable federal institutions to perform risk assessments consistently, and to formalize a structure for combining departmental risk assessments to create a whole-of-government risk picture to support emergency management planning in federal institutions."[14] The model that was built consisted of the AHRA methodology, collaboration environment (i.e., interdepartmental workshops of risk subject matter experts), experimentation with a multi-criteria risk assessment technique, and development of new techniques and tools that continue to be tested and improved. The information baseline is partially represented by the 652 documents in the CSS library. PS and departments have their own information resources. This baseline is dynamic, and at this time, much of the information is unstructured, which means that building a NRA model would benefit from some standardized processes and automation support.

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[14] Simona Verga, "A Holistic Cross-Government All Hazard Risk Assessment," http://www.thecornwallisgroup.org/cornwallis_2012/SVerga_C17_AHRA.pdf. Accessed 2013.

DRDC CSS TR 2013-014

2.2.4.1 AHRA Interdepartmental Working Group

The IWG[15] developed a model that would support both near-term and strategic applications for differentiating risks, prioritizing risk treatment strategies and making balanced capability investments. The IWG consensus was that a reasonable AHRA model should address the interconnected nature of Canada's risk environment and help to facilitate the consolidation of diverse risk assessments. On November 16, 2009, the IWG presented the following conceptual model to ADM EMC to illustrate how the work could evolve into a NRA capability (see Figure 3).
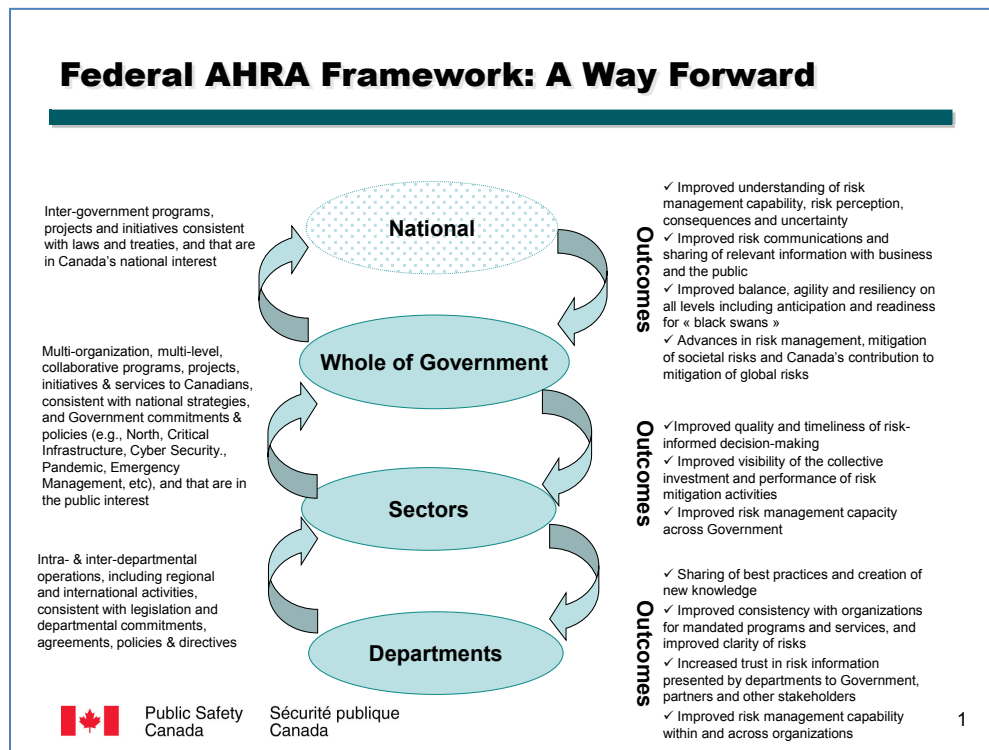
Figure 3: AHRA Way Forward (ADM EMC, 16 Nov 09)

2.2.4.2 Interdepartmental Risk Assessment Working Group

ADM EMC agreed to continue to develop the framework through a phased approach under PS leadership. In FY 2010/11, the Interdepartmental Risk Assessment Working Group (IRAWG) was formed. ADM EMC is engaged in the selection of scenarios, and DM EMC is briefed on progress. The IRAWG adopted the following phased approach:

- **Phase 1**. Federal institutions received guidance from ADM EMC (by March 2010). This included PS input on changes to the Emergency Management Planning Guide (EMPG),

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[15] Co-chaired by PS and the PCO, with CSS providing project management support from 2009 to 2010 when the AHRA work transitioned to PS.

AHRA Methodology Guidelines and other EM documents. The working group also received updates from DRDC;

- **Phase 2**. An informal risk assessment community of practice was established to focus on the priority scenarios (by June 2010). PS expected to provide such support as a web-based platform to share information, development of a community risk map, and further refinement of a compendium of risk assessment activities within federal institutions, and identification of other relevant resources and activities, such as symposia, training and workshops; and

- **Phase 3.** A collaborative process provided a common risk picture for specific scenarios and, assuming that the output influences decisions on treatment strategies, the work would increases the GC capability to prioritize and treat high priority risks (by October 2011).

Therefore, the work has evolved to the point where it is applying the model to support decision making and EM future planning. The AHRA Methodology Guidelines (PS, 2012), which are reviewed in Chapter 5, describe the building of the risk assessments themselves.

2.2.5 Run Base Use Case in the Model

The AHRA IRAWG activity provides the mechanism for running the model. It is not described further in this report. However, it is noted that a systematic process should be created to capture lessons from the annual assessment cycle, and from other initiatives to implement and/or adapt AHRA to other GC requirements in order for this information to contribute to a BoK. That is, lessons should be analyzed from both the working group and from the larger perspective (e.g., relevance to a NRA).

2.2.6 Document the Model

Documenting the concept-based model can be viewed in two timeframes – the preliminary work including the pilot project, and the ongoing scenario-based developmental activity and risk scoring. The CSS information baseline includes: the AHRA library; the AHRA Methodology Guidelines; and the Transition Project reports. Separate repositories reside in PS and participating departments. The implementation strategy and transition plan sections of this report include a lessons learned activity that should include defining the state of these information resources and the information management process (sections 7 and 8, respectively).

2.2.6.1 AHRA Preliminary Work and Pilot Project (2006-2009)

The IWG planned to develop the following products[16] that are part of the information baseline:

- **Project initiation and planning documents;**

- **Lexicon to establish a common set of terms;**

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[16] Some key references are listed in Volume II Folio 2 and others are available from CSS.

- **Taxonomy to postulate categories of risk including threats, vulnerabilities and impacts;**

- **Concept document for AHRA;**

- **Inventory of participating organizations' practices; and**

- **Compilation and analysis of participant risk assessment methodologies;**

Other priorities precluded staff from finalizing the last four products:

- **Technical papers;**

- **Demonstration plan for an AHRA;**

- **Recommendations on training needs; and**

- **Final Report.**

The challenges of collaboration are well understood by PS, DRDC CSS and participating departments. The project, communications, information and document management capabilities are major tools for a NRA concept to overcome these challenges. The implementation, transition and exploitation parts of this report provide some ideas for addressing these challenges, starting with learning about practices in other levels of government, which may actually be more streamlined and flexible.

2.2.6.2   Scenario-Based Development Approach (2010 to present)

The IRAWG approach uses high priority risk event scenarios, and DRDC CSS continues to investigate the application of OR, computer-based techniques (e.g., Full-Spectrum Scenario Management System) and architecture to aid in scenario development, uses and management.[17] The IRAWG workshops considered the following scenarios in the first two cycles (see Table 2). The selection of scenarios includes the perspective of regional offices.

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[17] See Folio 13, in Volume II. Simona Verga, "A Holistic, Cross-Government All Hazards Risk Assessment," CSS, 2012.

Table 2: AHRA Risk Event Scenarios

Risk Event Scenarios	
2010-2011	**2011-2012**
Health • Emerging zoonotic respiratory pathogen outbreak • Listeriosis outbreak • Foot and Mouth Disease outbreak	**Health** • Pandemic human disease • Foodborne outbreak
Natural • Hurricanes • Flood	**Natural** • Earthquake • Hurricane • Ice Storm
Unintentional • Marine oil spill	**Unintentional** • Nuclear accident / technical failure • Marine polluants – accidental chemical event
Malicious • Aircraft disaster (cargo) • Aircraft disaster (passenger) • Chemical release incident • Cyber incident	**Unintentional Social / Intentional Criminal** • Influx of illegal migrants **Malicious** • Cyber attack • Terrorism event

2.3 Challenges

This sub-section considers several challenges associated with the AHRA from two perspectives - development and implementation of concept-based approaches.

2.3.1 Concept Development

At the Society for Risk Analysis (SRA) 2012 annual conference, a senior risk manager in the US DHS described three 'overarching' challenges facing risk assessment approaches and the organizations that they support as follows:

- **Governance** - Decision analysis is distributed across organizations. Therefore, risk assessments cannot be communicated to a single decision maker or homogenous audience. Assessments have to be tailored and adjusted to cater for a wide range of experience and perspectives. Further, optimization depends largely on the judgment of the presenter, which points to the need for some higher level oversight and S&T rigor;

- **Data** - The paradox is that there is both an absence of data while at the same time an abundance of it, which can contribute to uncertainty. The challenge for risk analysts and decision makers is how to bring the information together and how to deal with such attributes as: qualitative; quantitative; unstructured; informal; and evidence-, fact-, and/or science-based inputs; and

- **Directionality** - A risk assessment is a snapshot of current risk, and its priority ranking is relative to the other risks being assessed at the time. It is not an absolute assessment. Risk assessments have to be forward looking. A challenge is to marry risk assessments up with foresight and emerging trends, and combine them to enable forward-looking approaches, strategic analysis and decision making. The anticipatory aspect of risk identification and assessment is a challenge for the design of best practice.[18]

A key challenge is epistemological.[19] Three approaches that are widely used to categorize risk perspectives are techno-scientific, socio-cultural and/or social constructionist.[20] In the BoK author's view, while AHRA could be interpreted as technical-scientific, it can also be considered as a concept to consolidate risk perceptions and support selection of actions that minimize risk in multiple categories.[21]

A variety of challenges are pertinent for advancing the AHRA concept, risk management in the federal government in general and the transition to a NRA concept.

2.3.2   Concept Implementation

In 2008, the Section Head for the RACI section in DRDC CSS, and principal developer of the AHRA concept, Mr. Alain Goudreau, stated that the AHRA study had pointed out the difficulty in implementing a robust risk regime in everyday decision making. He highlighted the following challenges:[22]

- **Decision making** - Organizational decision-making is challenged more and more by the push towards risk management regimes. The lack of a robust understanding of risk fundamentals across an organization will jeopardize the implementation of a sound risk management regime;

- **Level of detail** - The level of detail needed by an organization will vary greatly depending on the level (tactical, operational, strategic or local, regional provincial or national) and speed of influence (from policy to capability owner). There may also be sensitivity issues related to threat information or aggregated assessments;

- **Process Management** - Processes for tracking and auditing risks must be rigorous. As such, organizations should consider dealing with terminology at the outset. They should also consider structuring the risk problem through taxonomies that facilitate the

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[18] Adapted from notes of S. Friesen, CSS [Speaker, A. Cohn, Assistant Secretary Strategy, Planning, Analysis and Risk (SPAR), DHS Office of Policy. Society for Risk Analysis Conference, December 2012]
[19] Epistemology is the study of the origin, nature and limits of human knowledge; sometimes referred to as the theory of knowledge (Merriam-Webster, 2013).
[20] In her book *Risk*, Deborah Lupton investigates these major approaches to risk in social and cultural theory. See Deborah Lupton, *Risk*, Second Edition (London: Routledge, 2013).
[21] A useful summary of academic literature is provided in Michael Huber and Henry Rothstein, "The Risk of Organisation: or how organisations reconcile themselves to failure," *Journal of Risk Research*, 16 (6) (2013), pp. 651-675.
[22] Alain Goudreau, "Developing an all hazards risk assessment model," *Gazette* Vol. 7, No. 2 (2008), pp. 20-21. http://publications.gc.ca/collections/collection_2009/grc-rcmp/JS62-126-70-3E.pdf.

development of criteria to be measured. For each criterion, an appropriate metric should be adopted;

- **Consistency** - Consistency in applying the taxonomy, the criteria and metrics will be key to a robust risk assessment; and

- **Communications** - Communicating risk and uncertainty remains a real challenge. The time component or life aspect of risk — and its effect on individual components of risk — requires consideration, as does the notion of multiple risk assessments for different time horizons. The risk picture becomes more speculative as we look to the future.

These observations and insights were echoed in a recent paper that was published in 2012 by a leading OR specialist who has supported the AHRA: "the constantly evolving nature of man-made threats; shifting patterns in threats derived from natural hazards; and increasingly complex ways even simple threats can lead to societal disruption, because they act on an increasingly interconnected and complex society."[23] An NRA concept would need to develop strategies to address these challenges.

2.4   Conclusions

The AHRA work demonstrated that a conceptual approach that does not pre-judge the outcome remains relevant for future AHRA work and for transitioning to a collaborative national NRA concept. The stakeholder community has remained relatively stable since 2006, which proves that there is interest and commitment to improving risk assessment practices to support of cross-mandate and national initiatives. The AHRA initiative determined the practicality and value of developing a common framework that is scalable and adaptable across organizational, mandate and other boundaries, which would be relevant for a process that engages other jurisdictions and the private sector. S&T, OR and architecture have important roles to support the development of consistent, credible, repeatable and sustainable approaches to risk prioritization and decision support. Additional conclusions from implementing the AHRA conceptual model include:

- **Systematic approach**; A systematic approach is needed to describe the 'problem space', consider multiple stakeholders' perspectives, and produce quick wins that help to maintain senior management support and sustain momentum;

- **Collaboration**: Enabling interested participants to stay involved and contribute easily are essential elements to be able withstand interruptions in funding and other discontinuities, to sustain the personal networks, and to provide directionality to the overall approach;

- **S&T Support**:   OR and architecture are strategic enablers for designing and implementing a national strategy; and

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[23] Verga, S., Dr., A Holistic, Cross-Government All Hazards Risk Assessment, CSS, Draft, 2012.

- **Flexibility**: Keeping the overall concept and big picture in mind and accepting some level of uncertainty and ambiguity will enable the concept to be agile enough to take advantage of new ideas.

The implementation strategy and transition plan sections of this report contain activities to capture lessons learned from the AHRA community, which would expand the information baseline. This activity should also document the participants' concerns and strategies for implementing a NRA concept.

Next steps might consider:

- Concept paper on the convergence of AHRA with a capability assessment methodology for safety, security and resilience, preferably focused on the regional level (Note: The application of capability assessment for resilience exist in the literature);

- Concept paper for an NRA based on a series of workshops (e.g., region-led, scenario-based workshops that produce regional risk profiles focused on high priority risks for the region, combined with a capability gap analysis that makes specific recommendations to improve safety, security and/or resilience;[24]
- Conceptual and/or logic models to reflect a (national) safety, security and resilience paradigm;[25] and

- A deliberate strategy to complete and sustain a review of academic literature.

Decisions or direction likely include:

- Whether to combine AHRA with capability assessment or keep them as separate methodologies and processes; and

- Whether to open up the AHRA toolkit to include other decision support techniques that can be exploited to differentiate risks and prioritize treatment options (i.e., reduce the emphasis on subjective snapshot of risk and shift the focus to include the bigger picture). (Note: ISO 31010 provides a list of 31 risk assessment techniques).

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[24] The terms safety, security and resilience is used to make the capability boundaries more explicit. EM and/or incident management are one element of resilience. Operational resilience is defined as the organization's ability to adapt to risk that affects its core operational capacities. It is the emergent property of operational risk management… (CERT Resilience Management Model, 2011:976-977)
[25] An output of this concept could be a national strategy that embraces all three domains at each level of society that could be an umbrella document for separate national strategies for each domain.

3 Governance

3.1 Purpose

Governance is defined as the organizational process of providing strategic direction for the organization while ensuring that it meets it obligations, appropriately manages risk, and efficiently uses financial and human resources (CERT-RMM, 2011: 973). The epistemological basis is that AHRA accepts and promotes that there are multiple 'ways of knowing'. Analytical and synthetic propositions are both relevant including abstract analytical reasoning and experience-based 'gut feeling'. The AHRA concept considers past events, near misses, incidents of others, trends, and plausible futures. Given this broad perspective, it is important for senior leaders to support and participate in the process to ensure that the investment is focused on relevant risks facing Canadian society.

This section discusses the complicated nature of governance of safety, security and resilience by considering three as-is models – federal safety and security; national emergency management (EM) and the Canadian Safety and Security Program (CSSP). This chapter also presents a simplified governance concept that would build on the knowledge and experience of all levels of government and their constituents, and that considers relationships with cross-border partners that face similar threats and hazards.

3.2 Background

Risk assessment processes are inputs to other planning process including EM and national contingency planning. The outputs of risk assessments can affect policy development, legislation and investment decisions. Federal governance structures are influenced by political, legal, historical, economic and cultural forces. While structures exist now for federal EM and for discrete elements of safety and security risk domains, providing the right level of governance is a major challenge, especially in areas where decisions are time-sensitive. Prominent examples would include decisions that require strategic investments, such as investments in risk treatment strategies for medical countermeasures, infrastructure, counter-terrorism, climate change, natural resources, S&T, and Canada's global reputation and influence.

3.3 Discussion

Three models that influence the federal AHRA governance construct are:

- Federal safety and security management;
- National emergency management; and
- The Canadian Safety and Security Program (CSSP).

3.3.1   Federal Safety and Security Management

Governance approaches are mentioned in multiple PS documents including: the AHRA Methodology Guidelines; the EMPG; and the Federal Emergency Response Plan (FERP).[26] These models are predominantly based on institutional mandates, founded on the principle of accountability as per the Government of Canada (GC) machinery of government, with some higher level of oversight provided via interdepartmental and Cabinet committees, and ultimately, the Cabinet. The GC has multiple strategies and action plans that are fitted into this hierarchical governance structure.

The AHRA activity is an interdepartmental effort that is governed by ADM EMC. In 2012 (AHRA Cycle 2), governance was extended to include the Deputy Minister (DM) EMC. While this structure clearly addresses EM and public safety risks, the linkage to security is less clear. National security in terms of defence, and security and intelligence is governed by other mechanisms.   The term security is also used in the context of critical infrastructure (CI) protection, which embraces food, water and other security management regimes. The environment, natural resources and law enforcement have their own multi-level governance structures.

The GC has designated primary, supporting and coordinating departments, for CI protection, where ten CI sectors have been delineated (and have remained static since inception);[27] and for the FERP,[28] which defines thirteen Emergency Support Functions (ESF), but these activities are not synchronized or subject to a common governance structure. The effect from an AHRA perspective is that the value of the governance structure is diluted, and it is very difficult to measure or demonstrate success.

It is noted that AHRA started out in the defence and security realm, and then it evolved into a methodology that is being applied across safety and security domains. Much depends on what decisions the risk assessment is intended to support. If the assessments are intended to influence federal EM planning that is one thing. If the assessments are intended to support decisions related to capability improvements in national security, public safety and EM, that is another. In this governance model, departments implement their own capability improvements based on their own prioritization and risk assessment processes, supported by the normal program reporting and budgeting mechanisms. Risk information is shared on a case by case basis.

Engaging other levels of government and industry will require a governance approach that is suitable for all stakeholders. It is also noted that the other nations that have implemented national risk assessments have national security strategies, and legislative and funding authority, which GC and PS do not have. In other words, they are able to operationalize their risk assessments using a 'carrot-and-stick' approach that closes the gaps.

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[26] A list of federal references and quotes that mention risk assessment is in Volume II.

[27] The US DHS has defined 18 critical infrastructure / key resource sectors. The problem with Canada's high level grouping is that is difficult to transition from theory to practice due to the complex stakeholder relationships and overlapping jurisdictions. A taxonomy view of the CI sectors would be helpful.

[28] The FERP is being re-written. The current version relies on institution- and mandate-specific risk assessments.

3.3.2   National Emergency Management

The governance of national emergency management activities is explained in the EMA, Emergency Management Framework (EMF), the National Disaster Mitigation Strategy (NDMS) and elsewhere. Historically, the structure was designed to provide federal assistance when requested during an incident, and to provide financial and other assistance after the incident to manage the consequences. The construct is essentially a multi-jurisdictional, shared responsibility that is trying to address all aspects of emergency or incident management, which implies strategic investments by all levels of government and the private sector.

Federal, Provincial and Territorial (F/P/T) governments developed the EMF, which focuses primarily on emergency management and by extension, public safety. Other frameworks deal with defence, sovereignty, CI protection, crime prevention and other discrete security or safety mandates. The governance of this mosaic of strategies depends largely on where decisions are made to spend money or allocate resources. Within the EM domain, the EMF is intended to support legal and policy frameworks, programs, activities, standards and other measures. Yet, there is no mention of collaborative approaches to the development of capabilities or S&T. The Minister of PS and the respective P/T ministers govern this overall activity through the Senior Officials Responsible for EM (SOREM) mechanism.   Presumably, the concept of a NRA would be communicated to SOREM to get their input.

With few exceptions, there are only a few capabilities that could be considered federally-controlled or "national" in scope.[29] The assumption that the status quo division of responsibilities between the federal and P/T levels is fine may be the largest obstacle to a NRA approach. To launch a NRA activity, without a good understanding of expected outcomes, funding mechanisms and decision making authority could be counter-productive. The governance concept must be larger than just managing risk assessments. It must consider how the information will be used, which means extending the AHRA scope to include decision support for risk treatment and ultimately, balance of investment (BOI) decisions.

3.3.3   Canadian Safety and Security Program (CSSP)

DRDC CSS manages the CSSP, and performs research on risk assessment techniques and practices in support of national safety and security objectives. CSS specialists (e.g., engineers, defence scientists, OR practitioners) provide advice and tools to support the diverse GC requirements. CSSP also supports the P/T and broader first responder community by funding projects in support of other safety and security activities (less defence).[30]

CSSP is primarily governed through two partnerships defined in enabling MOUs:
 1.   Interdepartmental MOU[31] - Establishes the mechanisms for managing and delivering horizontal S&T; and

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[29]   Search and Rescue (national program office – service operated by DND and Canadian Coast Guard); CBRNE and Urban Search and Rescue (USAR) – services managed by municipalities; National Emergency Stockpile System (NESS) and National Anti-Viral Stockpile (NAVS) - services managed by PS and Health Portfolio (Health Canada, Public Health Agency of Canada).

[30] S&T support for defence is provided by Defence R&D Canada (DRDC) and industry.

[31] The MOU (2008) included the following signatories: Agriculture and Agri-Food Canada; Atomic Energy Canada Limited; Canada Border Services Agency; Canadian Food Inspection Agency; Canadian Nuclear

2. DND and PS MOU - Establishes DRDC CSS as the coordinating body for federal public safety and security S&T, responsive to policy direction from PS.

Together, these MOUs vest authority with the DND Assistant Deputy Minister for Science and Technology (ADM S&T)[32] and the PS Assistant Deputy Minister Emergency Management and Regional Operations (ADM EMRO). These federal executives guide the federal public safety and security S&T activities.

The CSSP governance model is comprised of a Program Management Board (PMB) and a Steering Committee that oversee the program. The Director General (DG)-level PMB is co-chaired by the DG DRDC CSS, and the PS DG Emergency Management Policy and Planning (DGEMPP). The ADM Steering Committee is co-chaired by ADM (S&T) and ADM EMRO. It comprises ADMs responsible for policy, operations, intelligence and S&T. The committee establishes the strategic priorities for the program on an annual basis, which are described in the CSSP Strategic Planning Guidance (SPG) document.

DRDC CSS governs individual investments by applying program management practices. Selection of S&T priorities is dominated by a systematic, interdisciplinary process to evaluate capability gaps on multiple levels including across safety, security and emergency management domains, including consideration of all aspect of EM including prevention / mitigation, preparedness, response and recovery. This process also considers intelligence, threat trends, futures analysis and other sources, including activities in other nations.

3.4   Issues and Challenges

Any strategy to develop a viewpoint of national risk exposure and emergency preparedness will face a complicated set of governance challenges, including those faced by existing federal and/or P/T/FNI initiatives. Governance requires further analysis. Some preliminary thoughts on systemic constraints that could influence a future more agile approach to governance are summarized below in Table 3.

In its report card on its 2012 strategic outlook, the Conference of Defence Associations Institute (CDAI) Strategic Outlook for Canada 2013 reaffirms that a national security strategy is a "critical aspect of policy direction that is lacking and that would serve to guide the various government departments in their actions and enable a more cohesive response especially in times of crisis."[33]The absence of a national security strategy, and the associated national assumptions and planning priorities, are challenges for implementing a national risk assessment concept.

Safety Commission; Canadian Security Intelligence Service; Communications Security Establishment Canada; Department of Fisheries and Oceans; Environment Canada; Health Canada; Industry Canada; National Research Council Canada; Natural Resources Canada; Public Health Agency of Canada; Public Safety Canada; Public Works and Government Services Canada; Royal Canadian Mounted Police; and Transport Canada.

[32] ADM S&T is also the CEO of DRDC.

[33] George Petrolekas and Ferry Dekerckhove, *The Strategic Outlook for Canada* (Ottawa: Conference of Defence Associations Institute, February 2013). http://www.cdainstitute.ca/images/Vimy_Paper_6_Strategic_Outlook_2013_EN.pdf. See Recommendation 1 – Promulgate a National Security Strategy, page 7.

Table 3: Preliminary Summary of Challenges

Systemic Constraints	Description
Current Political structure	• Legislation (Other nations that have implemented NRA programs have centralized models with appropriate legislation.) • Multi-level, geographical construct with shared responsibilities (e.g., crime prevention, policing, public health, safety, accident prevention, medical systems, emergency response, risk management) • Regional, national and international relationships and approaches • Reactive mechanisms to prioritize and address deficiencies in the near-term • External pressures (e.g., North American, continental, hemispheric, global priorities and assistance to foreign incidents)
Multiple risk management concepts	• Mandate and institution-focused processes • Institution-focused views of threats, hazards, vulnerabilities and impacts • Mandate-focused EM planning processes • Flawed concept of "risk ownership" and transferring risk (e.g., to other levels of government, the private sector or the public) • Departmental risk profiles intentionally avoid operational risks, and tend to focus on compliance, and program and financial accountability
IT infrastructure inflexibility	• Limited availability of effective collaborative and knowledge management tools • Departments have implemented their own IM/IT solutions that pose limitations on collaboration, and safeguarding and sharing sensitive information
Limited financial arrangements	• Limited mechanisms to redistribute funds, support experimentation and implement a strategic risk assessment program • Dependence on voluntary participation and self-funding could be a showstopper • Fragmented views of priorities including for academia and S&T, and lack of common performance measurement frameworks • Planning and funding focus on fiscal year basis
Lack of Strategic management	• Limited science / policy interface • No national security strategy (policy from 2004) • Reactive, politically-driven national strategies and planning processes • Focus on institutional mandates and discrete risk assessments • Lack of targeted improvement roadmaps[34] • Lack of reliable performance measurement information • Limited understanding within the Public Service of systems engineering, architecture, OR and S&T • No national, holistic view of risk management capability or direction in academia (e.g., education, research) • Limited futures, foresight and trend analysis capability

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[34] Targeted Investment Roadmaps = term used in CERT-RMM, CMU SEI,2011: Appendix B, 957.

3.5　Future Governance Construct

Considering the complicated safety, security and resilience governance landscape in Canada, it is likely that a new model is needed to advance a strategic NRA activity that does not include defence in its scope. The AHRA activity was largely been self-governing by the participating departments until 2010, when PS assumed a more proactive role. Since 2012, senior management has been engaged through interaction with emergency management committees. AHRA has included policy, operations and risk science perspectives as an inherent part of governance.

For a NRA, an alternative is to have the regional authorities govern the activity supported by federal risk SMEs, operations domain specialists and executives. The outcomes of a regional approach could include regional and sector risk profiles, an integrated cross-boundary risk management plan that is supported by contingency or similar emergency management plans, and inputs to an overall national risk profile. To be able to analyze and consolidate these profiles into a national picture, some common approaches would be required that are relevant for regions. This work should converge with the ongoing PS work on critical infrastructure, which envisages creating risk profiles on multiple levels. Furthermore, a literature search could identify strengths and weaknesses of regional and federal approaches.

A comparison of the existing and a potential governance models is presented below in Figure 4. This figure illustrates the complicated hierarchical and parallel construct that is used today. If PS Canada attempts to lead a NRA activity, then this model would still be applicable, possibly with the SOREM proving guidance and oversight functions. Other sources of political input could include the Council of the Federation[35] and the Federation of Canadian Municipalities. However, if regional EM authorities assume the lead role, then a new construct that is more flexible would probably be required including one that extends to bordering US regions. More analysis of existing regional governance models would help to develop a suitable national strategy.

At the 2013 Premier's conference, the Premiers indicated that, "Taken together, the programs are meant to bring a more strategic approach to dealing with disasters by preventing them or limiting their damage, rather than paying high, clean-up costs after they happen."[36]

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[35] In its July 2013 Premiers' conference, a member of the Council stated the need to "make sure that we're setting the right priorities and acting as soon as we possibly can…" Adrian Morrow, "Premiers discuss disaster mitigation in wake of Alberta floods and Lac Mégantic," *Globe And Mail*, Friday, July 26th, 2013.
[36] Ibid.
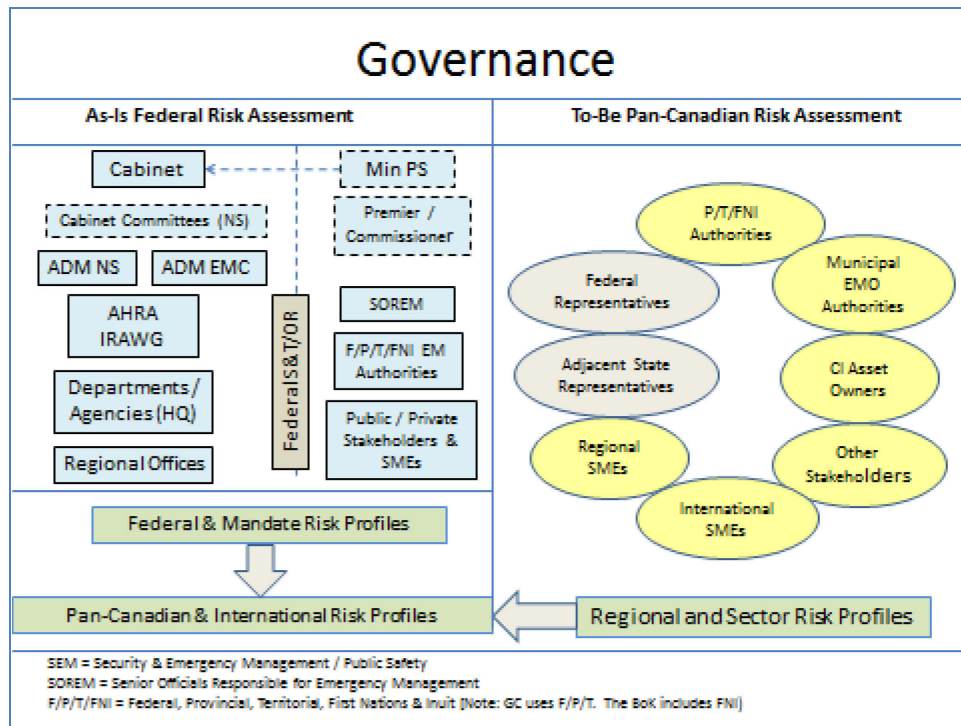
Figure 4: Possible Future Governance Conceptual Model

Moreover, the following factors could influence future governance option analysis:

- **Risk Management**. Departmental practices are based on policies that are mandate-specific. While DMs are ultimately responsible and accountable for risk management within their Departments, they are normally supported by a number of committees that cover security, emergency and business continuity management, IM/IT, audit and other domains;

- **Emergency Management**: The EMF describes the role of the SOREM to govern collaborative initiatives with other levels of government. The SOREM are supported by committees and operational lines of business managers within the P/T construct. Some P/T authorities have collaborative approaches with bordering provinces and states. It is possible that the answer to the NRA governance model lies at the P/T level;

- **Critical Infrastructure Protection:** Governance of CI protection is primarily based on industry assuming a leadership role to produce sector risk profiles. The various levels of government could produce their own sector risk profiles to address the Government Sector. The banking, IT and CI sectors have made progress; however, it is not known if there are other successful governance models. CSSP has an existing Community of Practice (CoP) in this area, and there should be relevant lessons on governance and collaborative risk assessment approaches; and

- **Co-evolving system between people and society:** Bourgon present a New Synthesis Framework where "the role of government in the 21st century extends to building the

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resilience of societies to adapt, absorb shocks, embrace change and prosper in predictable and unpredictable circumstances."[37]

3.6   Conclusions

Governance of safety and security risk management activities within the federal government is complicated.   There are success stories in the SOREM structure, CSSP and existing P/T programs.   These stories and relevant lessons should be captured to devise a governance framework that P/T can implement. The implementation strategy and transition plan capture this activity, as well as benchmarking other nations that have mature NRA programs.

The SOREM model is essentially a national construct.   However, It is not clear that the same model would work for a NRA activity.   Strong networks exist throughout the safety, security and resilience (EM) domains that have knowledge and experience related to specific threat and hazard categories.   Many federal agencies work with other levels of government on a regular basis, and those with regional offices would have some insight into regional risks and assessment practices. Valuable lessons for how to govern NRA from the federal perspective also lie within the CSSP governance model.

The transition plan (Section 8) lessons learned and benchmarking activities would consider existing governance approaches in Canadian federal programs (e.g., health, CIP, cyber-security, counter-terrorism, border security, food security, etc.).   The analysis would also identify P/T/FNI and regional experience including the engagement of cross-border states, industry and other stakeholders (e.g., non-governmental organizations).   The benchmarking task would provide insight into practices used by other nations' risk assessment programs, including the application of S&T, research and development (R&D) and OR.

Next steps likely include:

- Concept paper on flexible governance model for a regional strategy;

- Comprehensive review of success stories in industry (i.e., critical infrastructure – energy, health, policing, banking, information and communications technology);

- Review lessons from other nations' NRA program that are relevant to Canada, which in the case of the US may mean focusing on bordering states;

- Review terms of reference for existing governance bodies for appropriate guidance for members to be able to add value; and

- Develop measures of effectiveness (MOE) framework for governance.

Decisions or direction likely include:

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[37] The New Synthesis project (NS6) is a collaborative international research network of individuals and organizations in Australia, Brazil, Canada, the Netherlands, Singapore and the United Kingdom. Jocelyne Bourgon, *A New Synthesis of Public Administration: Serving in the21st Century*, Queen's Policy Studies Series, (Kingston: McGill-Queen's University Press, 2011), pp. xiii, 134.

- Participative governance model for NRA – hybrid centralized (federal) and decentralized (regional) – regional authorities lead, with federal support, and consolidated on regional basis, as opposed to individual P/T models (e.g., SOREM and broader stakeholder input, possibly, including political input (e.g., Council of the Federation, the Federation of Canadian Municipalities), input from analytical groups (e.g., Conference Board of Canada, associations and academia), preferably during a pilot phase.

4 AHRA Foundational Building Blocks

4.1 Purpose

This section outlines the three major building blocks for the AHRA Framework. It considers them from two perspectives - AHRA methodology and a possible future NRA capability: [38]

1. **Lexicon**: common view of generally-accepted terms to eliminate inconsistencies and facilitate communications;

2. **Taxonomy**: graphical interpretation of inputs to the multi-criteria risk assessment process (e.g., threats, hazards, vulnerability, impacts, consequences) that supports risk identification; and

3. **Community Map and Compendium**: techniques for collecting and comparing information on stakeholders' risk assessment concepts, techniques, tools and practices.

4.2 Background

The term "risk" conveys different meaning to different people, disciplines and communities (e.g., health, counter-terrorism, resource security, border management, law enforcement). The term all-hazards risk considers the relationships of these diverse risk domains within a common framework. The initial AHRA work addressed the terminology issue by developing a lexicon of generally-accepted terms and taxonomy for mapping the risk domains to the respective communities of interest. The taxonomy highlighted the value of using classification systems to group threats, hazards, vulnerabilities, impacts and consequences within risk categories.

4.3 Discussion

This section describes the AHRA foundational building blocks with a view to identify next steps that are relevant to the ongoing federal AHRA activity and a potential NRA concept.

4.3.1 Lexicon and Taxonomy

DRDC CSS developed a common lexicon[39] and taxonomy with input from the IEG and the AHRA IWG. The primary techniques that were used to support this activity included:

- Brainstorming the relationships and interactions that are required between departments as part of developing the AHRA lexicon and community mapping exercise;

- Brainstorming and examining the role of taxonomies in structuring and communicating the breadth of the risk 'domain space';

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[38] The Exploitation Concept explores the term Pan-Canadian to convey a broader, inclusive set of stakeholders and the mechanisms overcome known constraints and challenges.

[39] Dr. S. Vega; IEG AHRA Risk Lexicon; DRDC CSS; Nov.5, 2007

- Examining the mutual departmental awareness and contributions that assisted in the development of the lexicon and community mapping;

- Analyzing how the lexicon was understood, debated and tested in the context of the AHRA, and how the community mapping exercise influenced the AHRA development process; and

- Assessing the quality and relevance of the consultation and engagement of scientific, operational/law enforcement, policy and intelligence communities in preparing the AHRA, including the level of effort of all stakeholders required to support the AHRA.

A major difficulty facing an all-hazards methodology was defining and finding good measures for probability and impact consistently across risk domains. The federal working groups were able to find definitions of risk that were precise enough to be useful at the working level, while general enough to accommodate diverse risk types. The lexicon, in combination with the taxonomy, strived to provide a common vocabulary that served to enable a consistent approach to federal risk assessments. To gauge its usefulness for future work, more analysis is required of the experience of federal organizations in using and adapting this tool.

Early in the project, it was realized that there was a need to have a structure or framework to be able to discuss threats, hazards and risks. Although the initial focus was on security threats, the framework was expanded to include all types of risks.[40] Malicious and non-malicious characterizations were used as high-level categories to shape the taxonomy and to bring the diverse risk communities together.[41]

The taxonomy illustrated the interconnected nature of Canada's risk environment. Among expected benefits, the intent of the AHRA taxonomy was to help analysts to consolidate risk assessments developed by different organizations for multiple risk domains and facilitate development of a whole-of-government, and eventually, national risk picture. It was also hoped that it would support the prioritization of risk treatment plans and capability improvements.

It is generally accepted that effective risk taxonomy has at least three important attributes: a classification scheme, semantics and a means to navigate through the risk domains in relation to each other. The AHRA scheme was designed with those attributes in mind. First, the AHRA Taxonomy established two major classes - malicious/adaptive and non-malicious/non-adaptive. Malicious threats are intentional (i.e., the risks originate from threat actors like terrorists, organized crime and extremists). Non-malicious threats include unintentional human-caused, health, accidents, technological failures and natural disasters. The taxonomy also included cross-cutting threats or areas of uncertainty, such as emerging technologies and climate change. The AHRA taxonomy partitioned threats/hazards into logical categories, and provided a "blueprint" for further analysis.

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[40] Taxonomy Based on 2008 Survey; CSS archive; detailed chart.
[41] Taxonomy Updated 2008; CSS archive; higher level diagram.

The taxonomy also indicated that a wide range of threats and hazards that could pose a significant risk to Canada. Examples of threat or hazards from the taxonomy include:

- Criminal gangs illegally moving people (human trafficking), drugs and weapons across borders;

- Natural hazards including: global warming; forest fires; tornadoes; ice storms; and floods, which are significant risks in some regions;

- Virulent strain of pandemic influenza that could kill thousands of Canadians, affect many more, and result in significant economic hardship;

- Infectious diseases including those found in food products or the water supply; and

- Technological failures and accidents such as explosions and oil or hazardous material spills that result in fatalities and economic loss.

The current taxonomy (drawn from the AHRA Methodology Guidelines 2012) is shown below. Some specific suggestions for further analysis are included in the exploitation concept (AHRA BoK, Section 9).

All-Hazards Risk Event Categories

Risk Taxonomy

Adaptive/Malicious Threats

Intentional
Threats

Criminal:
- Terrorist Act
- Extremist Act
- Individual Criminal Act
- Organised Crime
- Corporate/Insider Sabotage
- Corporate Espionage

Foreign State:
- State-Sponsored Terrorism
- Espionage
- Act of War

Non- Malicious Threats/Hazards

Unintentional
Threats/Hazards

Social:
- Migration
- Social Unrest/Civil Disobedience

Technical/Accidental:
- Spill
- Fire
- Explosion
- Structural Collapse
- System Error(s) Yielding Failure

Health
Threats/Hazards

Pandemics/Epidemics:
- Human Health Related
- Animal Health Related

Large-Scale Contamination:
- Food/Water/Air Contaminant
- Environment Contaminant

Natural
Threats/Hazards

Meteorological:
- Hurricane
- Tornado/Wind Storm
- Hail/Snow/ Ice Storm
- Flood/Storm Surge
- Avalanche
- Forest Fire
- Drought
- Extreme Temperatures

Geological:
- Tsunami
- Earthquake
- Volcanic Eruption
- Land/Mudslide
- Land Subsidence
- Glacier/Iceberg Effects
- Space Weather

Ecological/Global Phenomena:
- Infestations
- Effects of Over-Exploitation
- Effects of Excessive Urbanisation
- Global Warming
- Extreme Climate Change Conds.

Emerging Phenomena & Technologies:
- Biological Science & Technology
- Health Sciences
- (Re) emerging Health Hazards
- Chemical Compounds
- Emerging Natural Hazard(s)
- Material Science & Engineering
- Information Technologies

Figure 5: AHRA Threat/Hazard Taxonomy

Although the initial versions of the AHRA lexicon and taxonomy were a significant step toward, the establishment of a common understanding of Canada's risk profile, there are limitations and assumptions that will require additional study as a strategic NRA approach is developed. For example, the original AHRA work did not include critical infrastructure in its scope. Also not considered in the original AHRA taxonomy were business risks, which could be caused by political, economic, societal, technological, legal and environmental conditions that are not explicitly national-level. For AHRA, business risks were considered outside the scope of federal assessments, but it is likely that they would be in scope for regional assessments that adopt a hazard vulnerability risk assessment versus a scenario-based risk approach. In hindsight, considering that the GC bailed out the automobile manufacturing companies in the recession, business risks should be considered in scope to the national interest.

Ultimately, a set of taxonomies would probably be required support a strategic national risk assessment. The existing taxonomy does not present a full view of the risks facing regions and communities. To support EM planning on a regional and/or national level, it is necessary for regions to describe risks from their perspectives, and for regions to see their risks in a national level taxonomy. It should not be assumed that the federal taxonomy can be re-used as-is. However, by building on the federal experience, it may be possible to adapt or expand the taxonomy into one that is suitable for all regions. AHRA experience indicates that having a common taxonomy and vocabulary would make the assessment easier to compare and consolidate.

4.3.2 Community Mapping

Community mapping was another important technique that was used for gathering information from participating departments (22 federal institutions). The team validated and refined information by follow-up interviews and working groups. The process achieved the following:

- A map the all-hazards domain and community of interests;

- A horizontal view of risk assessment methodologies and experiment with harmonization; and

- Further development and demonstration of the AHRA framework methodology and techniques (e.g., exploiting mathematical and visualization techniques).

- Community mapping helped to identify strengths and weaknesses from an overall proficiency perspective across departments and risk domains including training needs, management approaches, policies and S&T. The original mapping has not been maintained and much of this analysis was not documented.

- The following activities comprised the mapping process:

  o Identify (map) the community through use of a questionnaire, and follow-up interviews to identify: mandates, roles and responsibilities, relevant risks categories in the AHRA Taxonomy, terminology, practices, risk assessment process, role as a user or analyst and expertise in risk assessment;

- o Reach consensus on terminology and creation of the AHRA lexicon;

- o Define the initial AHRA concept;

- o Develop a taxonomy through an iterative process, taking into account the risks identified across the departments;

- o Consider international standards as reference points on risk management principles, frameworks and processes for assessing risk exposure and priorities; and

- o Test various risk assessment methodology options, conduct sensitivity analysis and adjust the AHRA concept, techniques and tools.

The primary purpose of the survey was to develop a 'community risk map' that provided a collective view of the risks that are priorities for federal institutions within their respective mandates. The mapping also depicted the interrelated risks by partitioning them into logical categories (e.g. non-malicious hazards; health hazards; sub-category, animal health hazards; sub-sub category of foot-and-mouth disease risk). This process highlighted risks that are shared amongst multiple federal institutions. The secondary purpose of the survey was to develop a compendium[42] of the federal risk assessment methods, tools and analysis techniques to improve understanding and to provide a baseline of current practices.

The work did not evolve to the stage where there was a visualization of the diverse elements in the Compendium. Although some data elements were captured in an architecture tool, this data set was not developed further. DRDC CSS continues to investigate visualization of capabilities and risks. Examples of some departmental techniques captured at the time are listed below.

Table 4: Sample of Federal Risk Assessment Techniques

Organization	Federal Risk Assessment Techniques
CBSA	Risk assessments for Pre-Arrival Travellers, air and marine cargo
CNSC	Legislated threat and risk prioritization (various categories of licensees (Class I, Class II, etc.)
CFIA	Animal Health Risk Analysis Framework for Biotechnology-Derived Animals
CFIA	Food Safety Enhancement Program—which follows Hazard Analysis Critical Control Point (HACCP) principles, based on risk assessment
DND	Risk Management in CF Operations manual
CSS	CBRNE Consolidated Risk Assessment
EC	Environmental Risk Assessments (under the Canadian Environmental Protection Act (CEPA)
HC	Human Health Risk Assessments for Chemical Substances, health products etc.
ITAC	Terrorist threat assessments
GC CTEC	Cyber security threat evaluation

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[42] See compendium document in CSS archives.

Organization	Federal Risk Assessment Techniques
NRCan	Expert issue-specific risk analysis for resource-related hazards (e.g., HAZUS/MH)
PS	Incident Risk Analysis Report to support strategic contingency and action planning
TC	Multi-modal risk assessments at strategic, operational and tactical levels; assessment related to air cargo security

4.4   Conclusions

The lexicon and taxonomy initiatives benefited greatly from the input of PS EM policy specialists, departmental risk practitioners, and DRDC CSS OR and architecture specialists. Although all federal departments are required to have risk-based approaches as per the Management Accountability Framework (MAF) and the integrated risk management framework, these practices tend to focus on corporate and compliance rather than on operational risks. The AHRA community overcame this limitation because it was comprised of risk specialists from a significant cross-section of departments that use a variety of risk assessment techniques on a daily basis to support strategic, operational, functional and policy decision making processes.

The building blocks are examples of what would be required to support a NRA program. The current tools should be updated and/or replaced to maintain relevance for the federal AHRA activity, and they should be used as models for regional building blocks. A dynamic process, preferably supported by modern information management and communications tools, should be pursued to support migration to a NRA approach. The existing DRDC CSS Targeted Investment Project, the AHRA Transition Project, is investigating automation support, including a strategic asset management capability that is very relevant to the NRA concept.

CSS envisaged a set of taxonomies, but these were not developed. The priority of this tool should be reviewed for the federal AHRA and NRA approaches. A logical early activity would be to gather information on P/T approaches, so that a common set of tools can be built that can be used or adapted for all jurisdictions.   To streamline this activity, rather than trying to build a common set of tools for all regions before initiating the NRA, PS in conjunction with DRDC CSS should consider implementing NRA pilot projects with one or two regions to establish a baseline and to assess the amount of effort that would be needed. Federal-Regional councils could be engaged in this process to include a strategic perspective and get senior management buy-in.

The AHRA pilot project proved that community mapping is a useful approach to gather and consolidate information from diverse organizations. A similar approach should be used to do a horizontal review of P/T/FNI practices.   Adopting a gradual pilot project approach would streamline the activity.   A benchmark analysis of other nations' NRA programs would also contribute to this effort and make the building blocks more portable to other stakeholders.

The ongoing AHRA work continues to added other building blocks that should be considered as integral parts of the foundation including:

- Description of impact categories;

- Technique for comparing malicious and non-malicious risks;

- Techniques for displaying the output of risk assessments;

- Standard approach for describing scenarios;

- Library of high priority risk event scenarios (from GC perspective); and

- Workshop techniques.

The implementation strategy and transition plan include lessons learned and benchmarking activities that are designed to capture lessons and new ideas to update, replace or augment the foundational building blocks in order to continuously improve the quality of federal risk assessments and to develop a new information baseline that would help to prepare for a national program. This activity is referred to as 'rebaselining' the AHRA framework, which would take advantage of federal departments' experience implementing or adapting the AHRA for other safety and security activities, such as the Strategic Emergency Management Plan (SEMP), and FERP Emergency Support Function (ESF) and national contingency planning.

Next steps to consider include:

- For the existing AHRA, update the existing taxonomy to include cyber threats; develop taxonomies for impact and consequences; develop a high level capability-focused taxonomy with the first layer being safety, security and resilience; and

- As part of one or two NRA pilot projects, determine the state of regional capability maturity including the use of lexicons and taxonomies, community mapping or equivalent, scenarios, workshop practices, IT, collaboration tools and risk assessment techniques.

Decisions or direction likely include:

- Whether to take a fresh approach to the master taxonomy by considering malicious and non-malicious as characteristics, not categories, and use a more traditional approach to differentiate clusters of risks (less emphasis on threats); and

- Comprehensive strategy for collaboration, relationship, communications, information and knowledge management.

5   AHRA Framework

5.1   Purpose

The federal AHRA Methodology Guidelines document is based on the AHRA work sponsored by CSS and PS. It defines five steps to produce federal risk assessments. This chapter summarizes the steps and adds some practical ideas to improve clarity as an input to the Guidelines review process.

5.2   Background

There were challenges associated with implementing AHRA at the federal level, but the stakeholders overcame the technical and resource challenges through a spirit of collaboration and an interest in risk management. The resource challenge has increased with budget reductions and the GC priority to achieve a balanced budget by 2015. Therefore, even updating the Guidelines and associated tools will present challenges, let alone implementing the NRA.

The AHRA Methodology Guidelines explain the federal risk assessment process in plain language.   This section is written with a regional strategy in mind to overcome the challenges of transitioning the federal approach into one that works for P/T authorities and other stakeholders. Rather than simply identifying issues with the federal guidelines, the approach is to augment the material for future consideration.

5.3   Assumptions

Assumptions regarding the value-added proposition of AHRA need to be clarified whether the intent is to come up with a common risk ranking process or to provide a framework to engage diverse stakeholders in risk assessments and risk management discussions. 2013 has been a landmark year for disasters in Canada (e.g., forest fires, flooding, intense rainfall in major city, extreme heat, and train wreck and explosion in a downtown), and having a NRA process may be seen to be part of the solution to making better forward-focused decisions to improve resilience.

An implicit assumption appears to be that the federal guidelines can be applied or adapted to a national strategy, but this may not be valid. Regions have their own tools, techniques and approaches to risk assessment. Therefore, it is assumed that PS (possibly with the assistance of CSS) will determine what exists today to clarify the requirement for techniques and tools to implement risk assessment workshops in the regions.

From an implementation perspective, it is assumed that a regional approach will developed and evaluated as part of a pilot phase, and that the requirement is to focus on risks that are a high priority for the participants, which could be different from the federal scenarios that have been developed so far. It is also assumed that a series of workshops is required to engage multiple levels of participation in each region - specialists, business owners and asset managers, and senior decision makers.

5.4　Discussion

Managing risks to Canadian society requires systematic approaches that focus forward, and continuously increase insight and minimize uncertainty. Many techniques exist for specific risk domains that essentially follow the same step by step process as AHRA. As with any process, while it appears linear and progressive, the actual process is dynamic and flexible, so that new risks and new information can be considered in a timely manner.

The AHRA pilot project (2006-2009) designed, developed and demonstrated a systematic methodology that would enable federal organizations of different sizes and risk management capabilities to be able to participate in collaborative risk assessment process. In 2010, PS assumed the lead role for the federal methodology and published the AHRA Methodology Guidelines (2012). The methodology has evolved since 2010, with senior management and primary departments taking more proactive roles in the program. It is understood that PS intends that the approach, techniques and tools will be continuously improved and preferably, be reusable for a NRA approach.

The federal AHRA approach can be described as follows:

- Stakeholders identify threats and hazards from their perspectives that could impact Canada in the next five years;

- Executives from stakeholder organizations identify the priorities for the planning cycle based on their best judgment of national priorities;

- Working groups of experts (WGEs) develop risk event scenarios, describing causes and consequences, to provide context for risk assessment workshops;

- WGEs assess the risks and develop a relative ranking of risk exposure based on their best judgment;

- The results of the assessment are fed back to stakeholder organizations to support their risk management activities; and

- PS develops a cross-domain and scenario view of federal risk exposure that takes into account departmental treatment strategies.

5.5　Methodology Overview

The remainder of this section summarizes the five-step methodology and provides additional information that is intended to highlight opportunities for further analysis or improvement. Figures are taken from the AHRA Methodology Guidelines and are not commented on further.
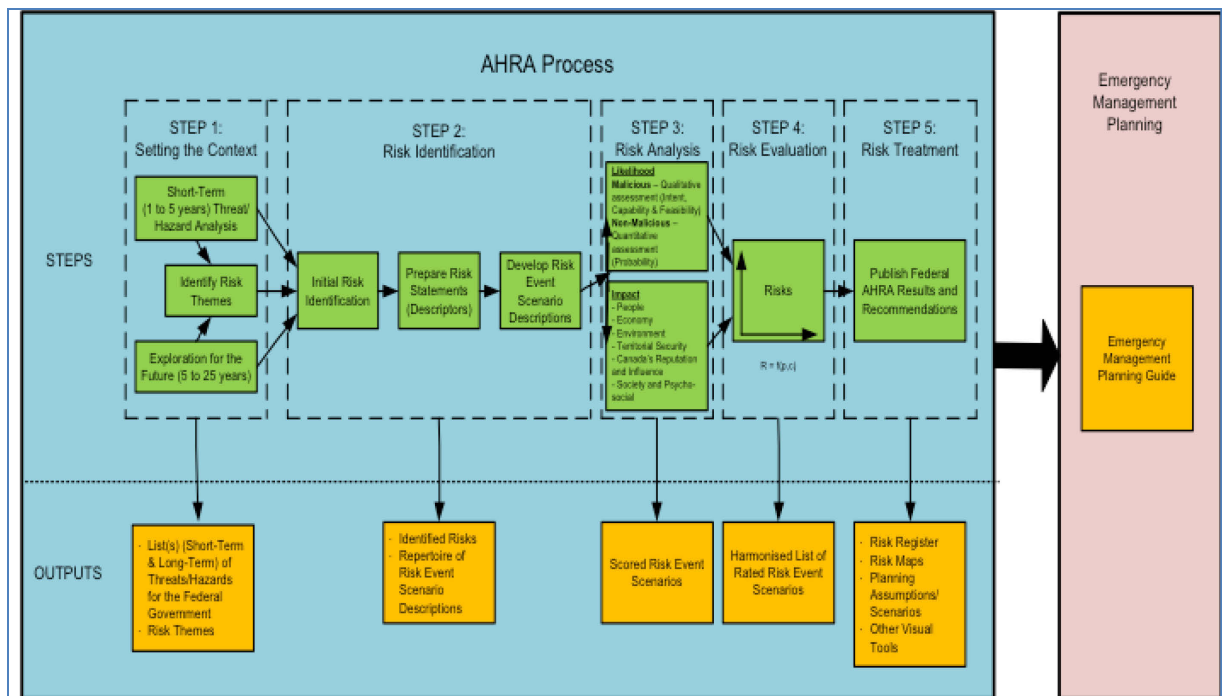
Figure 6: AHRA Methodology Overview

Observations on the methodology include:

- The technique caters to different approaches for estimating the likelihood for malicious and non-malicious threats (e.g., frequency, probability based on statistical data), while assuming that these categories can be compared later and placed in relative important on a single risk matrix;

- The technique uses six impact categories, which vary from other PS and Treasury Board Secretariat (TBS) risk assessment practices; and

- The process is focused on EM planning, which is not necessarily synonymous with broader safety and security operational requirements and capability analysis.

The AHRA intentionally focused on assessment (mainly Steps 3 and 4). The analysis of treatment options has not been developed to the same level.

5.5.1   Step 1 – Setting the Context

Overview: Setting the context for the AHRA establishes the scope and the boundaries of the assessment, and the strategic outcomes and performance objectives within the broader decision making environment.

Use: The use of risk event scenarios is the primary tool for creating the environment to assess federal risks. For a regional approach, the regional authorities and their stakeholders would be the best ones to define the context. They would already know the most serious risks facing their

jurisdictions. The federal perspective would complement the regional view of priorities. Some of the federal scenarios may be adaptable. Alternatively, having a regional perspective should make the federal scenarios richer and more useful for risk assessments and other purposes (e.g., exercises, testing plans, and capability assessments).

Inputs: Inputs to describing the strategic, operational and investment decision-making context include: legislation, mandates and policies; strategic plans, commitments and agreements; standards; environmental scans; threat, hazard and risk assessments; capability and strengths, weaknesses, opportunities (SWOT) analysis; and factual evidence and trends identified in reports (e.g., evaluations, audits, incidents, investigations, post-exercise reports, public consultations, judicial inquires, etc.).

Techniques and Tools: CSS processes and personal networks were used to describe the decision making environment including: intelligence (both classified and open source); international risk assessments; and foresight, futures and trend analysis. CSS developed a common structure for describing scenarios and has experimented with database tools. CSS is investigating other automation support approaches that would help to manage contextual information and identify the best value resources that could be mined as part of a systematic process. The Architecture Framework and capability assessment methodology are tools that help people keep the big picture in focus. Conceptual and logic models are effective tools to support strategic analysis and creative thinking, although they can also be traps if they are not dynamic.

Outputs: The PS guidelines use timeframes to shape the assessments on the strategic and operational levels. This distinction implies a level of certainty that may not exist.

- **Strategic** – Identification of risk themes, defined as areas of importance for departments and emerging and future risks looking forward 5 to 25 years. Factors include the type of risk and urgency to take action; and

- **Operational** – Risk event scenarios that consider a five-year horizon. Resources include: business models, business cases, Concept of Operations documents, guidelines, incentives, consequences, potential futures, risk tolerance descriptions, management and decision making frameworks, performance and risk indicators.

Strengths and Limitations: The main limitation is being able to identify and manage the most relevant information without getting bogged down in detail. Regions will have common and unique contextual information. However, emergency management capabilities are mature in virtually all regions, which should make it easier to compare and leverage the diverse perspectives of the decision, policy and planning factors. The focus of federal risk assessments on timeframes for risk events could be a limitation. The decision making horizon should explicitly consider when decisions are needed, the timeframe for actions to take effect, and the inherent resilience of regions, municipalities and communities. The PS work on the Regional Resilience Assessment Program (RRAP) and the Virtual Risk Analysis Cell (VRAC) are relevant to understanding the context for risk assessments by all stakeholders. Those two projects are new capabilities since AHRA was initiated, and these initiatives highlight the limitation of not having a dynamic process to keep the (risk assessment) capability compendium up to date.

5.5.2   Step 2 – Risk Identification

Overview: Identification of risk sounds straightforward and the PS indication of timeframes could help to differentiate between risks, issues and problems. The use of taxonomies and lexicons can facilitate the identification process assuming that they do not constrict the dialogue. Success depends on who is doing the identification and for what reason. The main tool is scenarios that help to shape the discussions.

Use: A clear description of the risks is essential to support all subsequent analysis and work so that risks can be differentiated by common factors including: time, potential impact on particular stakeholder groups, and ripple effects. There are variations used within GC for describing risks. For NRA, a consistent approach will be needed that makes sense to regions. The recommended approach is to us 'If-Then' statements. Another issue that should be considered is that some risks will have quantitative data associated with them and others will not. The process must be able to support both kinds of risk statements.

Inputs: The AHRA uses the guidelines glossary, backed up by the lexicon work and common taxonomy to assist the identification process. Furthermore, the current approach uses high risk scenarios to facilitate focusing the identification effort. For a NRA, it will be important to understand regional terminology and practices as a first step in the planning process. Regions know high risk scenarios in their areas, but these may be narrowly focused. There will also be different experiences with using all hazards approaches that will be valuable to the overall activity.

Techniques and Tools: The main techniques are open communications and describing the risk in plain language. Other risk description techniques may be useful provided that they are unambiguous, credible and repeatable.

Outputs: An inventory of risks, preferably related to specific scenarios, is the main output of identifications.   The process documents as many characteristics as possible within time constraints to be able to understand the risk and compare it to other risks. At his stage, the risk list should capture stakeholders, impact, existing or planned treatment strategies, constraints and other significant information.

Strengths and Limitations: AHRA demonstrated that value of engaging stakeholders with diverse perceptions of risks, and turning this aspect into a strength. AHRA also showed that applying a common language and tools can facilitate communications and aid risk identification across cultural, organizational, jurisdictional and other boundaries. It is a challenge to maintain and expand the taxonomies, community map, risk event scenarios and other tools, which requires some level of central administration, if not management. There are procedural and technology limitations to achieving consistent and credible risk identification including: managing who participates in the risk identification process, and when; managing participants' productivity and time commitment, documentation and communications with multiple audiences; and the capability to quickly engage other stakeholders and specialists.

5.5.3 Step 3 – Risk Analysis

Overview: The AHRA methodology uses six impact categories to differentiate risks. PS has described impact dimensions and relevant criteria within each category.

- **People**: fatalities and injuries, including physical injuries, displacement, chronic diseases and mental illnesses;

- **Economy**: direct and indirect losses on the Canadian economy;

- **Environment**: type of response, the geographical extent, magnitude and duration of damage;

- **Territorial Security**: disruption in the effective functioning of an area or a border, including the area affected, combined with duration and population density;

- **Canada's Reputation and Influence**: situations that would result in a shift in views towards the reputation and influence of Canada, and actions taken by citizens and/or stakeholders as a consequence; and

- **Society and Psycho-Social**: impact of widespread public anxiety and outrage.

The AHRA scoring approach results in the magnitude of impact being estimated to an 'order of magnitude' as a first step towards equating risk of all types. More specifically, the scoring method uses a logarithmic (half-log-10) scoring scale, and applies it consistently across the impact categories. A logarithmic scale allows the extent of variability and uncertainty associated with diverse hazards to be identified.

Use: The objective of risk analysis is to understand the nature of risks in terms of likelihood, frequency and/or probability and the potential impact and consequences over time. Analysis provides the basis for risk evaluation and decisions about risk treatment.

Inputs: The list of risks and supporting rationale are the main inputs for Risk Analysis. Normally, it is the same people doing the analysis, but the process should cater for changes in people. Also, during analysis new risks may be identified or old risks may be dropped. At this stage, major inputs are the experience, objectivity and analytical skills of those performing the analysis, whether it is ranking risks within a similar group or risks in different groups. Other examples of inputs that should be considered earlier in the process before the actual ranking of risks include: historical data; models and simulations; and for malicious risks, intelligence judgments and open source intelligence.

Figure 7: Information model for AHRA risk analysis

Tools and Techniques: According to the Methodology Guidelines, there are two processes within risk analysis - likelihood or probability analysis, and impact or consequence analysis. (Some clarification of these terms should be considered. For example, probabilities can be estimated based on historical data, whereas, likelihood is a qualitative judgment that considers uncertainty. Furthermore, impacts are not interchangeable with consequences. It is important to understand the potential consequences of a risk event or condition. The methodology goes into some detail in describing likelihood and impact assessments, which is not repeated here.

An AHRA scoring tool was created to help users (generally subject matter experts, risk analysts) define and score potential hazards and threats across the different categories of impacts and determine the likelihood of the risk event occurring within a five-year timeframe. The tool was built as a user-friendly Excel program with step-by-step prompts.

Outputs: According to the guidelines, the two main products are a risk register or a risk profile, and some rationale for identifying certain priorities based on the scoring technique.

Strengths and Limitations: The analysis process requires linear and lateral thinking skills. Analysis may uncover weak assumptions or biases that undermine the risk list and can be sources of conflict. A trained facilitator and open communications can address for these deficiencies. However, the process must be able to recognize and resolve potential conflicts quickly. Finding the right set of tools for the risks being analyzed is a challenge. The AHRA work focused on risk assessment. In order to evaluate the effectiveness of the risk analysis, the methodology should probably be expanded to consider the identification and prioritization of risk treatment options. Some of the same analytical techniques can probably be adapted (e.g., pairwise comparison), and there should be opportunities to introduce new tools). To maintain the credibility of the analysis,

assumptions, issues and concerns must be documented and presented to decision makers, when appropriate. AHRA's use of a common risk scoring tool that includes confidence assessments, and experimentation with calibration are techniques that are intended to overcome the challenges of comparing risks across groups and domains.

A limitation for malicious threats is the availability of intelligence and sensitive information. The Guidelines should provide more information on analysis and identify a range of suitable techniques for different applications.

5.5.4 Step 4 – Risk Evaluation

Overview: The purpose of risk evaluation is to interpret the results of analysis and present the findings in a form that is suitable for the intended audience.

Use: The evaluation is used to support identification and comparison of treatment strategies, and to provide recommendations to decision makers. Although, AHRA intentionally considered treatment to be out of scope, many of the analytical techniques and thinking are relevant.

Inputs: The main inputs to risk evaluation are the risk event scenarios and the risk list that ranks the risks in order of severity and need of management attention from the risk analysis. The risk inventory should already describe existing and planned redundancy and risk treatment plan that have resources assigned. Therefore, this step uncovers known gaps. In this way, the order of risk can be adjusted.

Techniques and Tools: The main techniques are visual presentations of risks, which can presented individually or in clusters. This step also serves as to validate the risk analysis, which can be done by the same group or in combination with external validation. The AHRA methodology experimented with different displays and a technique to compare likelihood assessments from diverse risk domains (i.e., malicious and non-malicious).

The method employed to evaluate likelihood and consequence varies depending on whether the source is malicious or non-malicious. The AHRA utilizes an order of magnitude approach, so that quantitative and qualitative inputs can be collected and rated . The impact assessments are amalgamated into a single measure of the expected impact or consequence, which is combined with the likelihood assessment to determine the magnitude of the overall risk associated with each scenario.

The one most commonly used technique is the risk graph, which may or may not include a matrix and uses of colours. Such a graph normally plots the likelihood and impact on the x- and y-axes (the estimated components of risks). The figures below (Figure 8 and Figure 9) are examples of options for presenting the risk analysis results. A cluster of risks can be shown graphically to help to highlight treatment strategies that would treat a broader set of risks and/or to reduce the impacts. The ellipses were used to analyze variability including the magnitude of the impact, and the confidence or uncertainty associated with the risk or cluster of risks.
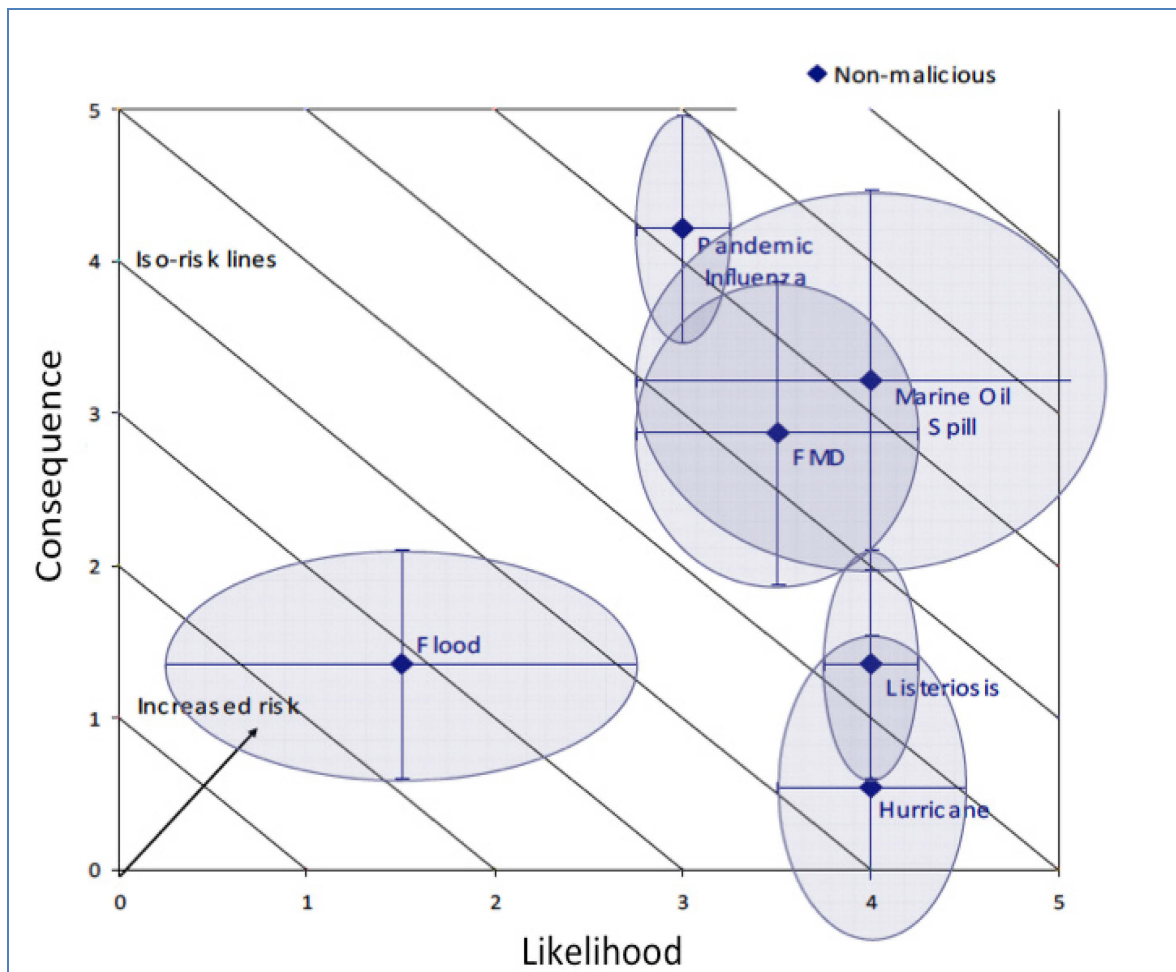
Figure 8: Risk Graph

The following bar graph (Figure 9) illustrates another way to group risks around discrete impact categories. The Guidelines state that this plot can help managers to establish thresholds for acceptable or intolerable risks.
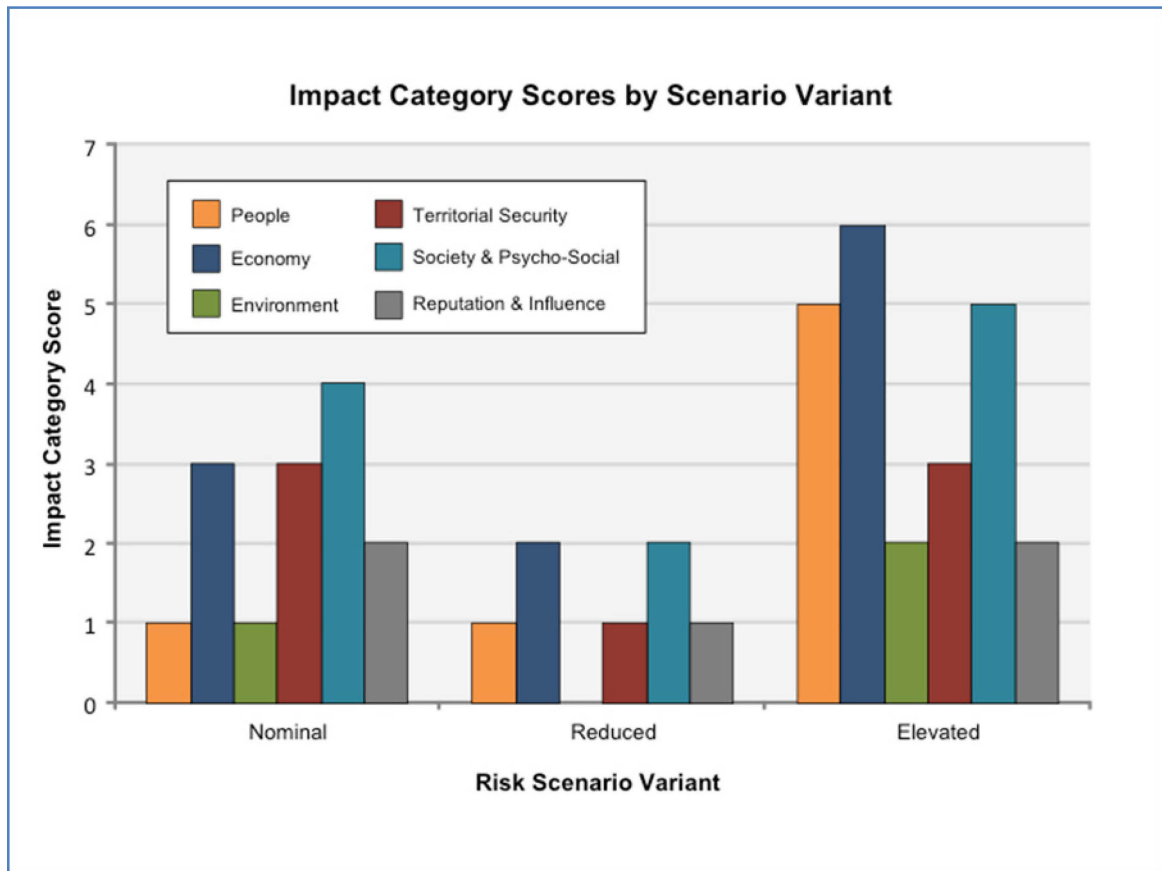
Figure 9: Impact Score by Scenario Variant

Outputs: The outputs from the risk evaluation process are the updated list of rated risk event scenarios, graphical representations of ranking of risks compared to those being assessed on the day, and preferably, performance and risk indicators for treatment options that are prioritized in the next step.

Strengths and Limitations: AHRA continues to experiment with and develop techniques to display risks that facilitate communications, help to validate the preceding risk analysis, and help participants to focus attention on the most serious risks being considered, and prioritized, at a given point in time. Limitations include the use of colour and whether matrices or isometric scales are used, and the familiarity of various audiences with these displays. A challenge is finding the right balance of simplicity without obscuring the complexity of the risk data set.

5.5.5   Step 5 – Risk Treatment

Overview: Risk treatment is the process of recommending risk treatment strategies and presenting options to decision makers that require allocation of resources and investment. This section of the guidelines is quite general and limited.

Use: Decision makers and other subject matter experts are engaged because there are costs and other potential impacts (e.g., mandates, legal, and procurement). This may actually be too late in the process to engage non-risk specialists.

Inputs: The relative ranking of risks is the main input along with the scenarios and available historical data that were the focus of the analysis.

Tools and Techniques: This section of the guidelines would benefit by considering capability assessment, and cost, benefit and risk analysis, and other techniques to choose the right balance of investments. If this step only documents or justifies existing plans, then it has limited value for the organization and its stakeholders. In fact, it can be counter-productive and undo the valuable insight gained in previous steps. This step is as, if not more, important than risk analysis, and it is the least developed section in the Guidelines.

Outputs: Risk treatment should yield recommendations on the preferred treatment approach including identification of risks associated with implementation. For the federal AHRA activity, PS produces annual reports, which guide the next cycle. The AHRA Guidelines refers to the risk register as the main output to provide a dynamic tool for managing the action plan. The distinction between risk registers and risk profiles is not clear.

Strengths and Limitations: The treatment selection process described in the Guidelines would benefit from greater clarity. Lessons from the AHRA methodology, which focused on Steps 1-4, could be adapted and expanded to support the treatment selection process. The approach to assessing risk treatment options would benefit from convergence of AHRA and capability assessment techniques, and a strategic view of the AHRA methodology. Other management techniques should also be considered in this step.

5.6   Conclusions

The AHRA Methodology Guidelines describes a five-step process to guide federal risk practitioners. A comparison of AHRA and international standards is provided in the Table 5 below. It illustrates that the AHRA methodology scope focused on identification, analysis and evaluation. Risk Treatment was considered the purview of the stakeholder departments that would have the lead role for risk treatment. ISO 31010 identifies thirty-one risk assessment and management techniques, which are applicable for identification, analysis and evaluation in one way or another. Furthermore, next steps should consider the Treasury Board Secretariat work on integrated risk management (IRM) policy and guidelines, as this methodology includes all phases of the risk management continuum.

AHRA started out focusing on security risks. It evolved into a methodology that would enable comparison of risks across a broader spectrum of risks. Given federal resource constraints and the continuing challenge to select investment options for a range of federal, regional and local risk scenarios, it is also clear that future AHRA/NRA work should consider how the outputs of the process fit within the broader management environment. For example, in the federal context, PS should consider the relationship of AHRA with the IRM framework, and the Guidelines should explicitly bridge any policy, process and procedural gaps. Otherwise, managers on multiple levels could see AHRA as a stand-alone methodology that is good at identifying risks,

but that is not useful within the overall risk management process as an inherent part of decision making both within GC and with other jurisdictions.

The early AHRA work developed a compendium of techniques used by different departments, but this inventory has not been maintained. A benefit of the AHRA work is that there is a community of interest that has been considering a variety of risk event scenarios from multiple stakeholder perspectives. This knowledge can be exploited to refine the AHRA Methodology Guidelines, and to use the federal guidelines and methodology as a model for a strategic NRA activity.

Similarly, this group could be sustained and either adapted to work with other levels of government to develop a NRA methodology, or it could serve an independent body that could validate regional risk assessments and treatment strategies by adding in a federal perspective. In either scenario, a significant amount of planning and preparation would be needed to migrate to a NRA. This body of knowledge presents ideas on the way forward for (federal) AHRA and/or a (strategic) NRA in the chapters on implementation, transition and exploitation.

Table 5: Comparison of AHRA and CAN/CSA-IEC/ISO Standards

All Hazards Risk Assessment	ISO/IEC 31000 *(Risk management)*	ISO/IEC 31010 *(Risk Assessment)*
	Communication and Consultation	
Setting the Context	Establishing the Context	
Risk Identification	Risk Identification	Risk Identification
Risk Analysis	Risk Analysis	Risk Analysis
Risk Evaluation	Risk Evaluation	Risk Evaluation
Risk Treatment	Risk Treatment	
	Monitor and Review	

There is an inherent misconception when prescribing the magnitude of a risk; that is, the number is strictly quantitative. In reality, a subjective value placed on the likelihood of a given event including for malicious threats. Further subjectivity is introduced to the mathematical equation when placing a value on an impact (e.g., value of human life). To address uncertainty, the AHRA evaluation methodology allows for risk estimates. The AHRA Methodology Guidelines and other communications should be clear on the inherent limitations of risk assessments.

Managers should be conscious of cognitive dissonance within the risk analysis process including the biases of risk practitioners. When people choose to accept a risk, they tend to reinforce that choice by justifying the rationale and therefore, decreasing the recognition as a risk. Likewise, people can artificially inflate the consequence of risks because they have identified it previously, decreasing a risk practitioners' dissonance with the source. The artificial enhancement or diminishment of a risk can be countered by education, communications, experience, using scenarios effectively and having trained facilitators.

The AHRA Methodology Guidelines are not clear on how to perform the treatment selection process. This is an area that requires more analysis before launching into a NRA concept because

in the regions, the outcome must result in tangible action plans and positive change otherwise; they will likely not support the process. It appears that a new set of guidelines is needed for a NRA concept, especially if AHRA merges with a capability assessment methodology, expands the scope to include treatment prioritization, and considers other management and analytical techniques. A practical way forward could be defined by implementing a pilot project phase, similar to the AHRA approach. Therefore, PS/DRDC CSS should consider the following next steps:

- Federal AHRA Methodology Guidelines:

    o Expand the section on risk treatment including more emphasis on selection of strategies before focusing on specific actions,

    o New section on the scenario management process, and

    o Methodology guideline for capability assessment with AHRA as a companion document and/or component; and

- NRA (in collaboration with regional authorities):

    o Review of the risk assessment techniques in ISO 31010 and select a subset for further analysis for applicability to a regional toolkit, and

    o Develop a regional methodology guideline including a regional lexicon, master regional taxonomy and sets of taxonomies focused on regional high priority risks.

Decisions or direction likely include:

- NRA scope and boundary definition (e.g., identify risk domains that can be done quickly to refine a set of tools - natural disaster; or pick a hard problem like transnational organized crime); and

- Whether to separate the risk scoring process in time – that is, focus on clusters of risks in the same domain, compare the top 'n' risks across domains, by focusing mainly on impact, and delay the detailed analysis (i.e., comparison of malicious and non-malicious threats using mathematical techniques) until the treatment option analysis.

6   Architecture Frameworks

6.1   Purpose

This section discusses the role of architecture framework (AF) support to the AHRA concept development. Architecture provides an environment that helps people gain insight into a multi-dimensional problem by allowing analysts to develop and refine viewpoints of the system, its components and the interdependencies.   It acts as a mechanism that enables a comparison the various components of a system using a process that is repeatable and verifiable.

Architectures also provide a structured approach that supports the development of scenario-based risk assessments and therefore, capability-based emergency, safety, security and resilience management and planning processes. Additionally, architecture tools provide policy, capability and risk analysts with automation support to assist in data management, collaboration, and visualization of potential solutions to existing and future challenges.

6.2   Background

Since the events of September 11, 2001, the GC has invested in numerous programs and capabilities to enhance Canada's safety and security. However, the decision making environment is continuously changing, and to mitigate risk to an acceptable level means that organizations must anticipate changes in multiple environments, and if they are not able to anticipate changes, then they must be able to adapt quickly. Managing change should be forward-focused and proactive.   Effective risk assessment processes contribute to this management challenge. Strategies must be well planned, justifiable and achievable. Several national level governments have experimented with enterprise architecture as a technique and tool to support policy, planning and investment decision making. The US, UK, AS and Canada have worked on AF, mainly within the national security domain, but these techniques are portable to the public safety and societal resilience domains when management considers future investment from a strategic perspective. .

An enterprise-wide problem space can be modeled in a structured approach that can be hierarchical or flexible by defining the layers that characterize the potential capability including: people; business processes; information; decision nodes; infrastructure; systems and services. Applying a holistic AF helps analysts and decision makers to visualize the inter-relationships and identify factors that influence change. AF document 'as-is' (current state) and 'to-be' (future state) capabilities to enable gap analysis. Structured query tools help to identify anomalies, and eliminate inconsistencies in the layers and individual components.

DRDC CSS developed a conceptual AHRA AF by applying Canadian experience with the U.S. Department of Defense Architecture Framework (DoDAF) methodology. DoDAF is a standard way to organize system architectures. AFs are constructed by using a number of complementary and consistent viewpoints that enable comparison of strategic, operational and tactical capability

or system perspectives.[43] The AHRA architecture was built using Telelogic System Architect® Version 10.6.

6.3   Definitions

Two fundamental terms are associated with architectures:[44]

1. **Enterprise Architecture** (EA) **-** is the analysis and documentation of an enterprise in its current and future states from an integrated strategy, business and technology perspective. Sever GC organizations are experimenting with various EA tools, but they are not applying them in conjunction with a capability assessment methodology; and

2. **Architecture Framework -** is a structure for organizing information that defines the scope of the architecture, and how the areas of the architecture relate to each other. This technique can be applied to systems of systems, and used in conjunction with risk-based capability analysis.

Figure 10 illustrates the DoDAF conceptual model.   The CORE Architecture Data Model (CADM) is used to demonstrate how the different elements of the architecture are interconnected, and to manage and exploit the data. It defines the relationships between data elements, and it includes the metadata.

GC EA capabilities are still evolving.   Most experience is in documenting complex IT environments, not in assessing risks, analyzing capabilities, or identifying gaps and deficiencies in EM plans, programs, legislation or policy. DND has had an AF capability since 2003, but the level of investment since then has been modest and experienced architects are scarce.   Many industry products are converging on the EA space including those that are used for data mining, business intelligence and business analytics.   These products are becoming more familiar to managers, and PS/CSS may need to consider compatibility with these tools. The challenge is to provide dynamic scorecards or dashboards for risk and/or capability assessments. AF tools may not have reached this level of communications support.   In either case, there are costs implications for the technology and to develop the expertise to exploit the tools.

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[43] A full discussion of the tools is available on the DoDAF web site. A brief description of the results is included in the Body of Knowledge. However, for detailed explanation, readers should consult CSS, which continues to explore other software tools and other complicated problem sets.
[44] Software Engineering Institute
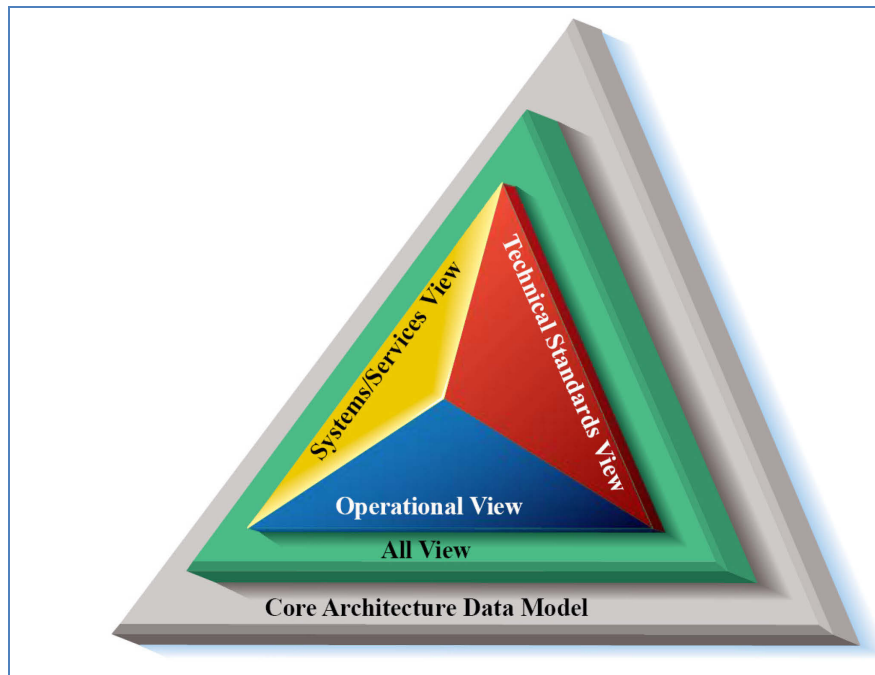
Figure 10: The US Department of Defense Architecture Framework (DODAF)

6.4   Objectives and Uses of the AHRA Architecture Framework

The AHRA objectives were to demonstrate the use of AF viewpoints to gain insight into risk assessments and to evaluate AF tools, such as the system engineering[45] application called 'CORE', which was developed by Vitech (US).[46] DRDC CSS provided this support as it had an experience architect on staff.   The project team recognized the inherent limitations of participating departments having little or no architecture experience at the time.

Objectives for exploiting architecture in support of the AHRA and/or NRA include:[47]

- Develop a framework that would support safety, security and resilience risk management on a national level;

- Develop the AF techniques and tools to support collaborative cross-mandate and cross-jurisdiction risk and/or capability assessments;

- Develop AFs that can be adapted to assess gaps in capabilities that protect the Canada's critical assets;

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[45] Systems Engineering is the **i**nterdisciplinary field of engineering that focuses on complex projects, work-processes and tools. It overlaps with technical and human-centered disciplines.

[46] Examples of other architecture tools with different levels of complexity and functionality include: Rational (IBM); Rhapsody (IBM); Systems Architect (IBM); Artisan (UK); and Casewise (UK).

[47] The list of objectives has been updated from the 2009 version taking into account the consolidation of S&T projects into the CSSP, and other changes in the management environment. This list that is presented is intended to be relevant to exploitation of the AHRA body of work and NRA.

- Identify opportunities to improve risk assessments processes that support safety, security and resilience strategic outcomes;

- In combination with OR, provide decision support to achieve balanced investments that support national strategies and action plans; and

- Identify opportunities for focused S&T, OR and R&D investments to support safety, security and resilience strategic outcomes.

6.5 Challenges and Assumptions

The challenges include: the availability of architecture specialists; management awareness of the potential value of using AF and OR to help interdisciplinary teams gain insight into complicated problems; the sensitivity of specific or aggregated risk information (e.g., specific capability gaps, and therefore, vulnerabilities); the cost and learning curve associated with AF software; and GC IT and procurement constraints. At this stage of the AHRA evolution, the main assumptions include: CSS will be able to continue to support AHRA and obtain SME input including from risk management specialists, operations and business managers, senior management, OR and futures specialists.

6.6 Discussion

DRDC CSS continues to apply its in-house architecture capability to support the federal AHRA scenario-based risk assessments and the CSSP initiatives. The AHRA AF provides a structure for organizing information that defines the boundaries of a system. The following figure illustrates interdependent layers of information that can be linked by applying AF with use cases, scenarios and input from subject matter experts.

Taxonomy / Ontology

Mandate /Policy / Legislation / Jurisdiction

Organization / Structure / Programs

Governance / Strategy

Methodology / Process / Frameworks

Techniques / Tools / Technology

Influences / Learning / Knowledge Ecology

Planning Assumptions / Constraints / Scenarios

Models / Simulation / Standards

S&T / OR / R&D
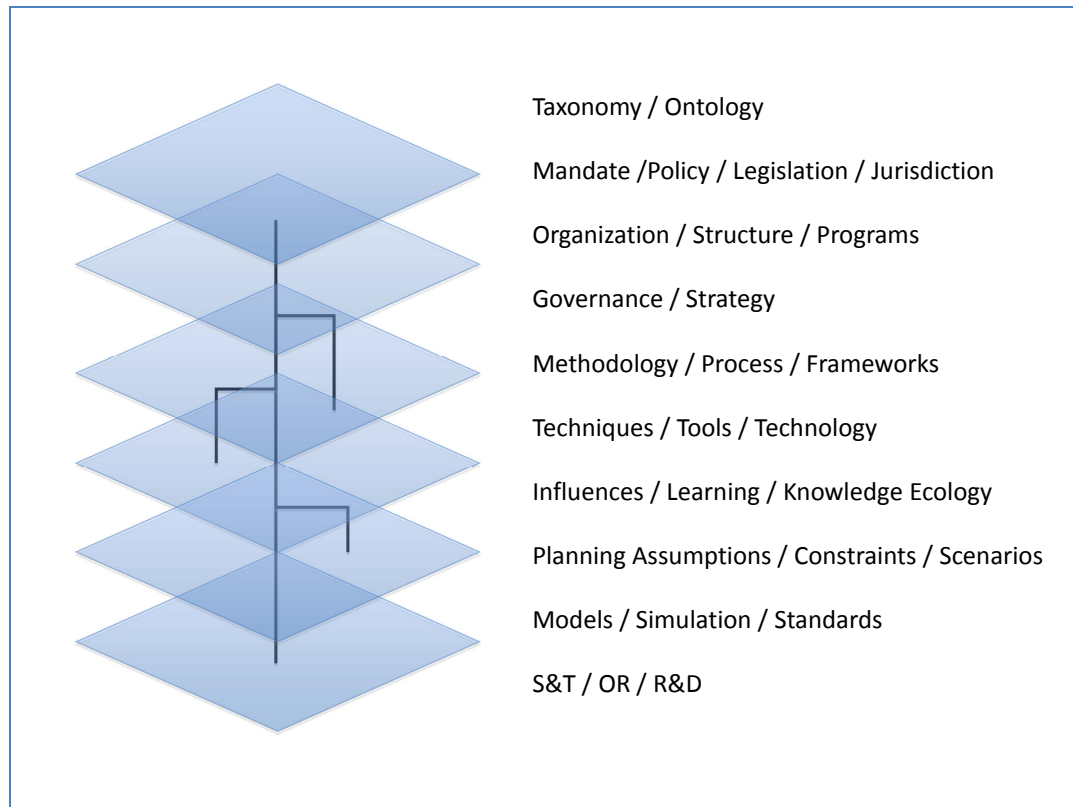
Figure 11: Example of AHRA Layered Architecture Conceptual Model

Inputs: Based on the initial AHRA taxonomy, DRDC CSS built a representative risk domain architecture. Information inputs[48] focused on:

- **Roles and Responsibilities:** Departments described the role of risk practitioners;

- **Relevant Risk Categories:** Participants identified categories of risk that were relevant to their mandates and legislation. This input supported development of the AHRA taxonomy; and

- **Risk Assessment Practices:** Participants identified practices to support a horizontal comparison of techniques and to assess the relative maturity of federal risk assessment processes.

The following sector diagram describes the overall AHRA Framework. Use cases and scenarios were used to test the framework. The AHRA working group developed a set of assumptions to clarify risk assessment boundaries.

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[48] More details on how the data was collected, analyzed and utilized are found in (Keown, 2008).

DRDC CSS TR 2013-014
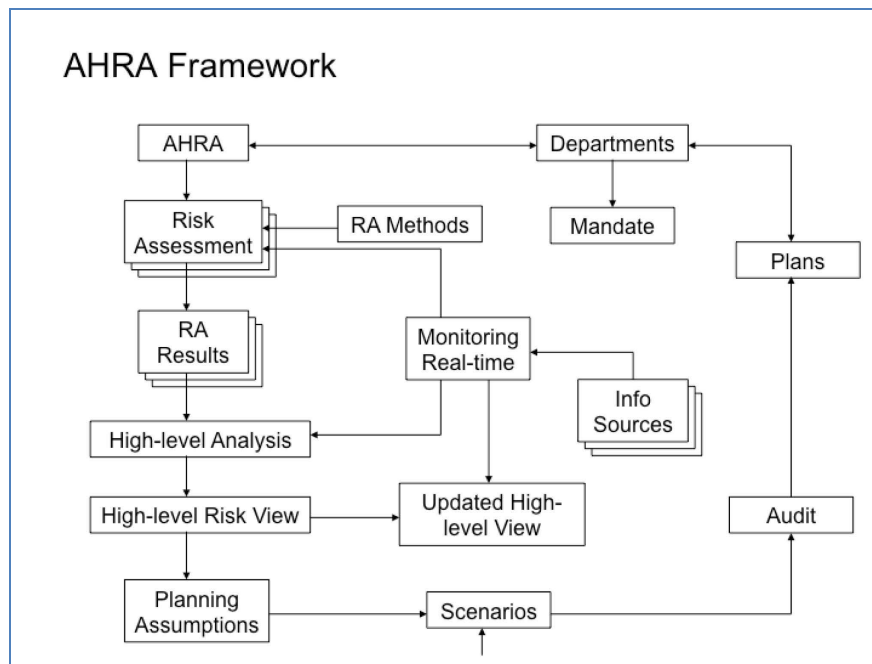
Figure 12: AHRA Methodology Framework

Outputs – Federal Risk Community Architecture Framework: The community mapping activity identified the risk events that were relevant for institutional risk assessments. This information was used to produce an Operations View, or OV-2, diagram. Activity Nodes are sections within organizations that conduct risk assessments. For example, a sample OV-2 shows a node representing the Canadian Ice Service section within Environment Canada (see Figure 13). The relationship between natural disaster categories and environmental risk assessments was considered in developing the AHRA taxonomy.
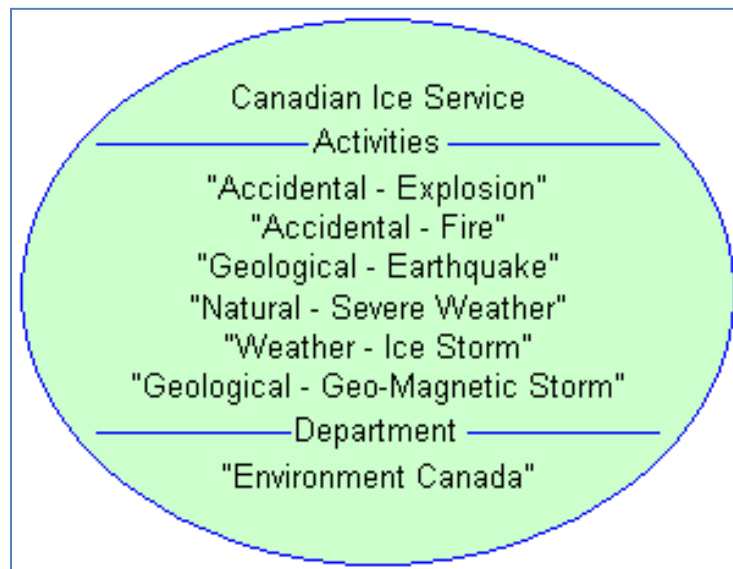
The AF also can be used to identify information or process 'need lines,' communications interfaces and other interdependencies between organizations to gain a better understanding of the overall capability or business system. The Operations View 5 (OV-5) translated the AHRA taxonomy into an operational viewpoint or Operational Activity Model. In the model below (Figure 14), each risk category or risk event in the taxonomy is represented as an "activity" that is required for a federal all-hazards risk assessment to be considered complete. The figure isolates an enlarged portion, for readability.

Figure 14: Sample OV-5 Operational Activity Diagram (linked to Activity Nodes)
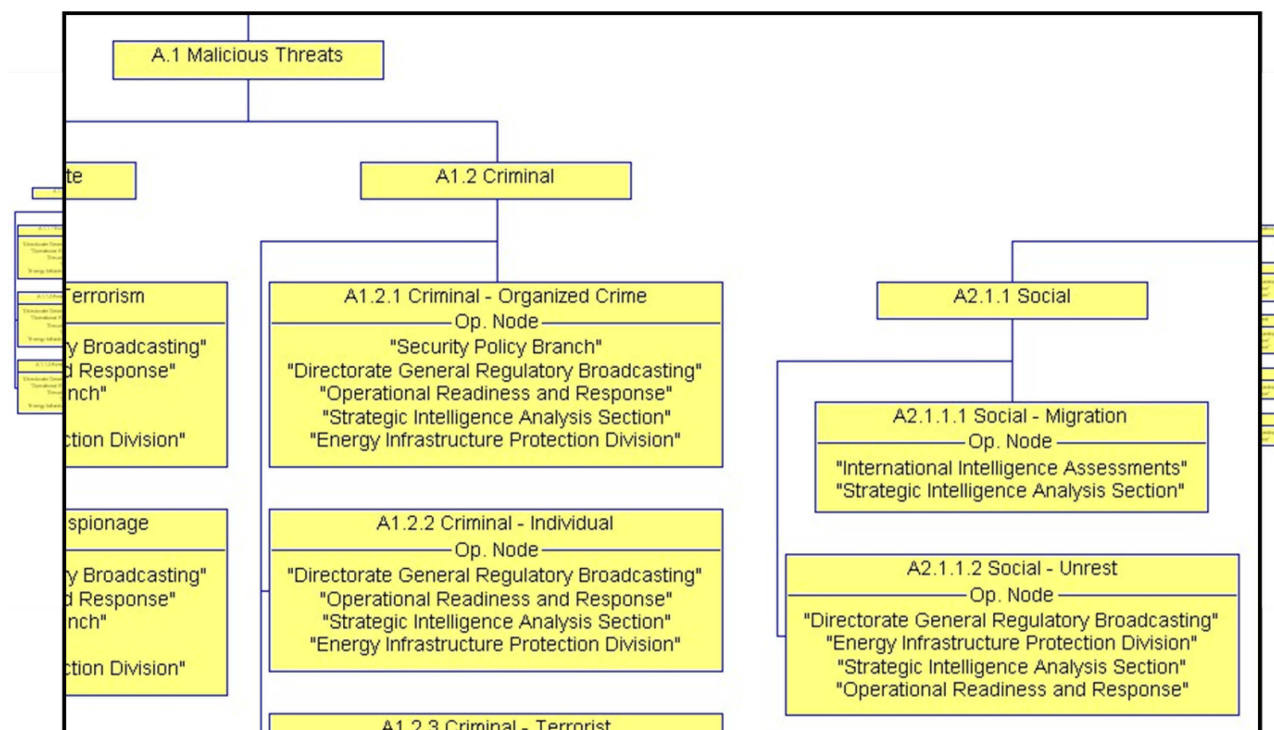
Based on the material collected from participants and literature research, the AF was used to identify elements of a harmonized methodology to produce a federal view of a federal risk assessment process that could be applied at the federal and/or departmental mandate.

6.7   Conclusions

DRDC CSS provides architecture support to PS including the federal AHRA activity, as well as CSSP activities.[49] The AHRA work demonstrates that AF can help to describe problem sets that cross organizational and other boundaries.   Federal organizations are structured along an

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[49] For an up to date description of the CSS AF capability, ongoing activities and to identify future high value projects, the reader should consult the Centre for Security science (CSS).

"architectural" concept – the Program Activity Architecture (PAA), which is used to map investments in programs and services to the organizations strategic outcomes and mandates.

Many departments are experimenting with business analytics and enterprise architectural tools, and they are developing in-house expertise in these areas. This suggests that the timing for more emphasis on architecture as a valuable management tools may have arrived.

If this assumption were valid, then PS should consider the value proposition of continuing to use AF to support future risk assessments in support of policy making, strategic planning and capability investments. This means that GC would need to have a sustainable pool of specialists with the appropriate knowledge and experience in designing and building architecture models, as well as the analytical skills to interpret the outputs for diverse audiences. While a starting point exists in several departments, it does not appear that this speciality has been considered from a GC or holistic public service perspective. The assumption appears to be that GC can tap into this expertise in the private sector.

AF was used to develop and refine the AHRA concept. Given a clear set of objectives and SME support, AF can be exploited to investigate the broader aspects of balancing the safety, security and resilience investments across jurisdictional and other boundaries. AF would also support the convergence of AHRA with the capability assessment methodology.

A detailed investigation of AF was beyond the scope of this BoK. However, it appears that the AF contribution to a NRA concept could include:

- Consolidating and comparing regional as-is and to-be capabilities;

- Linking risks and capabilities to national and regional strategic planning priorities;

- Mapping capabilities to policies, legislation and standards on multiple levels;

- Filtering of information and tailoring it to suit regional decision support needs;

- Comparing regional practices and identifying best of breed approaches and area for further investment;

- Linking stakeholders to specific risk scenarios and preferred treatment strategies;

- Comparing costs, benefits and risks for the regional and/or national capability improvement priorities over time; and

- Capability measures of effectiveness to demonstrate the value of investments to stakeholders and the relationship to Canadian values and economic security.

Next steps could include:

- Document the output of applying AF to AHRA Cycle 3;

- Document the business case (value proposition) for applying AF to safety, security and resilience;

- Do a literature research on the current state of AF in other governments with NRA programs; and

- Further experimentation, including with a NRA pilot project.

Decisions likely include:

- Whether to establish a PS AF cell to support its portfolio management strategic plans and/or societal resilience objectives;

- Whether GC considers EA as a public service competency; and

- Develop a GC strategy to exploit the best parts of AF to support risk-based, capability investment, emergency management, societal resilience and S&T decision making processes in support of 'hard problems'.

7 Implementation Strategy

7.1 Purpose

This section discusses elements of a program implementation strategy for of strategic NRA activity using streamlined program management and spiral development techniques that were demonstrated during the federal All Hazards Risk Assessment (AHRA) activity (2006-2012+). The strategy examines the issues and challenges. A preliminary work breakdown structure (WBS) highlights components of a systemic approach. The objective of this implementation strategy is to build on the AHRA and related work, and focus forward on transitioning to a NRA activity. The implementation Strategy and transition plan (section 8) identify opportunities for improvement in the federal AHRA framework and present ideas to support transition to a NRA in a timely manner.

7.2 Background

Many GC organizations, including DRDC CSS, have extensive experience managing complicated projects including joint, horizontal and multi-year collaborative efforts with other levels of government and industry. DRDC CSS support of the AHRA included creating project decision and management documents such as: Project Charter; a Project Implementation Plan (PIP); work plans; decision briefings; fact sheet; communications strategy; and a SharePoint Portal. The AHRA and other DRDC CSS work supported PS development of the AHRA Methodology Guidelines 2011-2012 and the Emergency Management Planning Guide 2010-2011. Developing a full implementation plan is not in scope for this project, and would likely be a PS remit. However, this chapter presents a program management approach that would be an input to a potential PS / DRDC CSS option analysis and business planning process. This strategy is presented as a discussion paper. It has had limited peer review, and it has not been validated beyond the CSS project team.

7.3 Challenges and Strategies

This section summarizes the challenges facing a NRA strategy. It is envisaged that outputs of a NRA would consist of regional risk profiles based on scenarios for the priority risks in regions, and specific recommendations on investments in capability improvements on national and regional levels. Systemic challenges that could prevent this outcome include:

- **Political will and leadership:** The NRA process would need to be seen by stakeholders to be an improvement over existing P/T practices. There would need to be practical planning assumptions and objectives, and tangible outputs; that is, a documented value-added proposition and business/use case;

- **Authority and financial mechanisms:** New authorities and/or flexible procurement and funding mechanisms may be needed to overcome constraints. GC should not assume that GC and/or P/T budget constraints will permit investment in a NRA, irrespective of the business case and potential value to be added;

- **Collaboration environment:** Collaborative processes, shared decision making and supporting IT infrastructures would improve the chances of success. There should be some useful lessons from the emerging AHRA Transition Project (data management initiative), CSSP, P/T approaches and other nations' programs;

- **Information management:** Strategies and processes are needed to manage classified and/or sensitive information, and to deal with access to information, legal and privacy issues. Departments, other levels of government, Canadian industry and other governments should have useful suggestions to overcome these challenges in the near-term;

- **Management:** The management approach needs to be flexible and efficient. The AHRA work demonstrated the value of having dedicated project management services. A governance structure that is perceived to be top-down and accountability-oriented is unlikely to be favourable for a regional approach. It is envisaged that a more flexible and participative, self-governance model should be pursued. Part of the management challenge is to ensure that people realize that the outputs of assessment workshops are snapshots in time based on applying mathematical formulas to subjective estimates. The lessons on scenario development should be a valuable AHRA output that can be directly applied to the NRA. Part of the governance challenge is seeing the big picture and being able to guide a process that looks at risks and potential impacts in multiple timeframes; and

- **Precision**: The illusion of precision is dangerous, especially when the people making the assessments are risk specialists and not necessarily business owners, and the outputs are not independently validated, and filtered for different audiences with diverse pressures, objectives, experience and risk perception. There should be some useful lessons from other nations' approaches that could be adapted at the national and/or regional levels. For example, the UK approach creates and sustains risk registers at the national, regional and community levels, with appropriate levels of detail and precision, depending on the context.

Some strategies to deal with the challenges are provided below (Table 6).

Table 6: National Risk Assessment - Challenges and Strategies

Challenges	Strategies
Political will and leadership	- Get P/T buy-in to do a regional approach including leveraging cross-border networks - PS and federal SMEs assume a supporting role - Regions lead the development of regional & sector risk profiles - Identify alternatives for multi-year funding and mechanisms to fund regional workshops, included in a strategic management framework - Engage senior management early, but do not involve them until there are a stable process, management framework and examples of useful profiles
Authority and financial mechanisms	- Identify alternatives to provide federal multi-year funding - Develop a shared funding model (e.g., Council of the Federation – 50/50 model) - Benchmark other nations' approaches and find a Canadian solution

Challenges	Strategies
Collaboration environment	• Regional authorities implement collaborative IT environments, and migrate to a common interoperable approach • Regions facilitate collaboration with stakeholders, possibly including IT such as, crowdsourcing, and social media • PS focuses in SME participation, and consolidation and analysis of outputs • Departments focus on scenarios that are relevant to them including multi-mandate agencies and/or scenarios • Create knowledge profiles for risk and capability analysts; architects and OR analysts
Information Protection	• Develop initial risk profiles using open source information • Segregate scenarios that require classified information, and implement a strategy to protect sensitive or classified information • Focus on strengths and known opportunities to improve capabilities instead of focusing on threats, weaknesses and vulnerabilities
Management	• Re-baseline the federal AHRA products • Develop a common set of tools to support a unified regional concept (i.e., taxonomy, lexicon, community mapping process) • Apply the AHRA concept, spiral development and pilot project strategies • Separate malicious and non-malicious categories to simplify the problem, and identify tools that are appropriate for specific risk domains – not one-size-fits-all • Develop a regional management toolkit • Develop risk domain toolkits (e.g., develop taxonomies and refine scenarios for different risk domains)
Precision	• Develop a communications management framework • Establish a regional information baseline and network • Experiment with a multi-level, iterative workshop concept that focuses on the top regional risks (e.g., 3-levels - SME's, business/asset owners, and public and private sector executives)

7.4   Assumptions

This section describes the assumptions for developing the implementation strategy and transition plan (section 8), which include:

- **Strategy, Legislation and Policy –** GC approaches to national security and intelligence, public safety, emergency management critical infrastructure protection and societal resilience will continue to evolve based on many factors, and the perceived value of having ready access to reliable risk-based approaches should continue to increase. Therefore, the demand for a NRA should increase over time, especially if other nations' continue to advance their programs;

- **Iterative Approach -** In the absence of changes in strategies, legislation and policies in the near-term, multiple iterations of a systematic NRA concept should be able to enable interdisciplinary, multi-mandate groups to prioritize risks and treatment strategies. It is also assumed that with the right leadership, and public and private sector will, that strategies can be developed to overcome the challenges;

- **Re-Baseline AHRA -** Prior to extending the AHRA beyond the federal community, PS will establish a strategic management framework and governance concept, preferably modeled on the CSSP approach, and the federal AHRA community will re-baseline the AHRA in conjunction with establishing regional information baselines. It is also assumed that PS will develop an overall data, information and knowledge management strategy to support collaboration that will address information security management, collaboration and knowledge management challenges for a broader audience;

- **Adapt AHRA Methodology Guidelines and Tools -** Elements of AHRA and other DRDC CSS work that should be adaptable or provide a reference point for a NRA concept include:
  - o Project management approach,
  - o Lexicon, taxonomy and community mapping processes and products,
  - o Scenario management concept and process that engages senior management,
  - o Techniques for quantifying and displaying risks,
  - o Technique for comparing risks from different domains (e.g., leverage lessons from work on comparing malicious and non-malicious threats[50]),
  - o Convergence of AHRA with the capability assessment methodology,
  - o AHRA Transition Project automation support concepts, and
  - o Convergence with the capability-based investment model (CBIM)[51]; and

- **Funding -** PS will implement a flexible approach to fund regional workshops and participation of regional SMEs, possibly by leveraging lessons from the CSSP governance or other GC programs.

7.5   Implementation Concept

This section presents planning factors to support implementation of a NRA concept.

7.5.1   Principle-Based Concept

The AHRA methodology principle-based approach is relevant. Just as AHRA depended on participation of interested and committed federal resources, so to would a NRA concept depend on regional stakeholders' continuous commitment.

7.5.2   Implementation Phases

Similar to the AHRA methodology, it is envisaged that a phased spiral approach should be used for a NRA strategy starting with a pilot project. The following phases are envisaged:

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[50] CSS recommended keeping these categories separate, but PS decided to combine them.

[51] CBIM has been extended to include Balance of Investment (BOI) and is generally referred to as Capability Assessment, which implies a streamlined approach to capability-based planning and capability management – terms that are not new and have been used in the military and are being applied in industry.

- **Initiation and Planning** (in parallel with transition) – This phase would establish the groundwork for preparation and planning for regional workshops to support the PS NRA direction and decisions;

- **Design, Definition and Experimentation** – This phase could employ one or two pilot projects (e.g., different regions that are most affected by federal high priority risk scenarios);

- **Full-Scale Implementation** – This phase would extend the strategy to other regions. Depending on lessons learned from the Transition and previous phase, Implementation could take 24-36 months. Regions could be done concurrently once there is a common baseline and toolset. Regions could focus on the scenarios that are of most interest to them, and then input could be sought from other regions. Advanced IT tools could be used such as crowdsourcing to broaden the consultation to validate the output of workshops, and to seek new ideas and to prioritize the risk treatment strategies; and

- **Sustainment** – So far, the AHRA concept focuses on cycles within federal fiscal-year timeframes. Plans are developed on an annual basis with voluntary participation and self-funding by departments. GC should not assume that this model is suitable for a national strategy. The Full-Scale Implementation Phase would include development of a Sustainment Plan that includes a strategy to manage a dynamic body of knowledge. The Transition Phase would follow on from the Transition Project recommendations for data management including leveraging existing regional tools and practices recognizing that the tools must work for a variety of audiences.

Chapter 8 describes a transition phase focused on re-baselining the AHRA, gathering lessons learned from IRAWG participants and others, and benchmarking relevant aspects of other nations' programs (e.g., governance, capability assessment, architecture, OR, data management, communications strategies, performance measurement, shared funding models, etc.). Transition could be managed in parallel, or be combined with the implementation initiation and planning phase.

7.5.3 Work Breakdown Structure and Work Packages

A high level WBS below indicates the work packages and deliverables for implementing an NRA concept that continues to exploit federal S&T capabilities.

Implementation WBS

Program Management

- Program Implementation Plan
- Supporting plans / frameworks – performance, communications, risk management, relationship management, procurement, workshop guide...
- Streamlined Governance framework; community contact information...
- Briefing notes; decision briefs; fact sheets;...

Policy

- Mandate, strategic outcomes, constraints...
- Review MOU;SOREM input; Regional Pilot Project...
- National Planning Goals
- National Planning Assumptions...
- Changes to EM Act?
- Information Protection
- IT tools (risk assessment, etc.)

Data, Information & Knowledge Management

- Data Sensitivity Analysis
- PS AHRA portal/environment
- Collaboration framework
- Community Mapping tools
- PS Digital Library requirement?
- Review requirements for web site & RA apps
- **Data & IKM strategy**

Environmental Scanning

- Gap Analysis by Region
- Priority analysis by Region
- Success stories – case studies (2-3 per Region)
- Stakeholder analysis
- E-Scan sharing framework
- Technique & tool assessment

Capability Assessment & Management

- Re-baseline Lexicon, Taxonomy, Scenario Management & other tools
- Community mapping plan for P/T/FNI; municipalities; industry; NFP...
- Re-baseline federal compendium, gap analysis & plan to close gaps
- Techniques & tools for NRA
- **Capability Assessment toolkit**

Architecture

- Re-baseline architecture
- Business case to create 3-person cell in PS; double CSS capability
- Technique & tool recommendation
- Learning Needs Analysis

Operations Research

- Verify technical paper priorities
- Identify priorities for NRA including risk assessment tools, advanced statistical analysis, etc.
- Review lessons from regional CI and EM RA work
- Gap Analysis Report
- **3-Year Work Plan**

Foresight, Futures & Trend Analysis

- Verify GC capability, benefits, requirement & options for FFTA capability
- Techniques & tools
- Priority Tasking
- **Way Forward Report**

Benchmarking

- Re-baseline foreign national RA programs
- Baseline Regional risk profiles & practices
- Re-baseline academic funded research activities focused on risk assessment & management; resilience, etc. (PS inventory)
- **Lessons learned report**

Figure 15: Implementation Strategy WBS

The next sections outline the purpose and expected outputs of the level 1 work packages. This is a prototype work plan.

7.5.3.1   Work Package 1 – Program Management

The basis of the original AHRA project was the PIP. DRDC CSS also normally produces project charters, project management plans and fact sheets. A similar approach could be used for a streamlined NRA; however there would be costs associated with collaboration with regions and any pilot projects. A flexible governance framework also should be developed that addresses known challenges and systemic constraints including mechanisms for building a shared vision and for cost, risk and information sharing.

A technology strategy should be developed that looks beyond existing tools like SharePoint. It should consider exploiting modern tools including decision analysis suites, social media, mobile device applications, crowdsourcing knowledge management and architecture. Presumably, such a strategy would be part of a larger PS strategy for safety, security and resilience. NRA could provide useful inputs to such a strategy. Furthermore, establishing a common framework that can exploit regional tool sets and best practices should be developed.

7.5.3.2   Work Package 2 – Policy

A NRA strategy and mandate should be clearly described including strategic outcomes and strategies to address known constraints. To mitigate risk and held get a handle on costs, regional pilot projects should be implemented. In parallel, discovery of any policy mismatches (i.e., F/P/T/FNI) or issues could be considered, possibly including changes to the EM Act. Important outputs of this activity should include national planning goals, national planning assumptions. Specific policy guidance is likely required for information management and protection given the IT and procurement constraints. PS and CSSP lessons should be applied to provide an adequate information baseline that can grow as better tools are exploited.

7.5.3.3   Work Package 3 – Data, Information and Knowledge Management

The AHRA methodology envisaged that standardization of inputs, intermediate results and final outputs should be part of the information lifecycle management process. Knowledge management is a discipline that promotes a systematic approach to identifying, capturing, evaluating, retrieving, sharing and creating information assets. "These assets may include databases, documents, policies, procedures, and previously un-captured expertise and experience in individual workers."[52]

To support migration of the AHRA, a strategy is needed to manage AHRA data and information, and facilitate knowledge exploitation, as part of the larger PS and CSSP information baselines. An objective of a regional benchmarking activity should include identifying existing P/T and municipal techniques and tools, and best practices. In parallel, DRDC CSS should be considering web-based tools. Two UK examples are:

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[52] Source: kmworld.com, quoting The Gartner Group.

- Climate Change Risk Assessment:
  http://ccra.hrwallingford.com/CCRAReports/reportviewer.html?sector=intro&link=Link Target_1; and

- Department for Environment, Food and Rural Affairs:
  http://www.defra.gov.uk/environment/climate/ .

7.5.3.4   Work Package 4 – Environmental Scanning

Environmental scanning is part of the overall DRDC CSS capability assessment methodology. Large departments conduct environmental scans to support strategic and business planning. These scans are relevant to understanding the context for risk management and investment planning. A community mapping technique could determine whether the existing departmental processes can be adapted to help describe the problem space for specific risk domains. This work activity should produce a common set of questions or frames as inputs to the federal scanning techniques that can be used by large or small organizations. A benchmarking activity should also review how other nations' NRA programs manage open source intelligence.

7.5.3.5   Work Package 5 – Capability Assessment

SWOT and gap analysis are familiar techniques that many organizations use to help identify investment priorities.   These techniques typically identify performance levels of existing and target capabilities to highlight gaps.   The AHRA work has evolved to the point where risk assessments support the overall capability assessment process, which in turn supports decision making on investments strategies. This task should assess the pros and cons of convergence of AHRA with capability assessment. Figure 16 illustrates a capability assessment methodology, which could become a foundational building block for a strategic NRA activity.
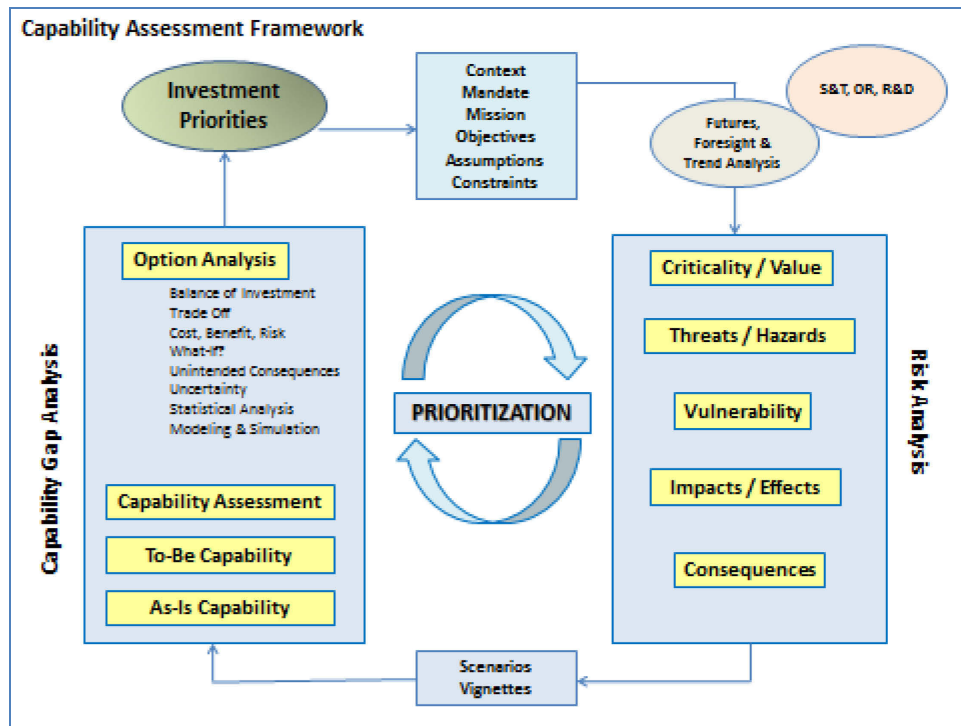
Figure 16: Capability Assessment Methodology

7.5.3.6   Work Package 6 – Architecture

The scenario-based risk assessment workshops are an opportunity to test and experiment with architecture and other techniques. PS and CSS should assess the feasibility and implications of applying AF to a NRA capability, and what this means in terms of resources, cost an effect on other AF work.

7.5.3.7   Work Package 7 – Operational Research

OR defence scientists have supported all aspects of the AHRA body of work. OR can help to re-baseline the AHRA within the broader context of a capability assessment methodology, and to evaluate other decision support techniques possibly to reduce the dependency on risk assessments. The OR task could include: review of lessons learned from departments and agencies that have participated in the IRAWG and/or have adapted AHRA for other purposes (e.g., Strategic Emergency Management Plan); analysis of foreign national programs in risk and capability assessment; and a process and criteria to differentiate regional capability investment priorities.

7.5.3.8   Work Package 8 – Futures, Foresight and Trend Analysis (FFTA)

The AHRA Methodology Guidelines mention foresight, but there is no description of this capability.   The following actions should be considered: verify GC practices (where do departments get futures information; and review options for a federal FFTA capability that can support the NRA and broader safety, security and resilience long-term investment strategy.

7.5.3.9   Work Package 9 – Benchmarking

A systematic approach to benchmarking would facilitate collaboration, traceability, verification, validation, and sharing of the outputs of benchmarking processes. Various commercial products could be exploited such as mind mapping tools to provide some structure to benchmarking activities. This task should demonstrate systematic approaches to benchmarking, while refreshing the information on other nations' NRA programs. This activity should also expand the search being traditional partner nations to consider other nations that have experience in specific risk domains that are relevant for federal and regional priorities.

Figure 17 illustrates how the information baseline and body of knowledge could be expended through more systematic and collaborative approaches to environmental scanning, lessons learned and benchmarking. The implementation strategy and transition plan start down this path.
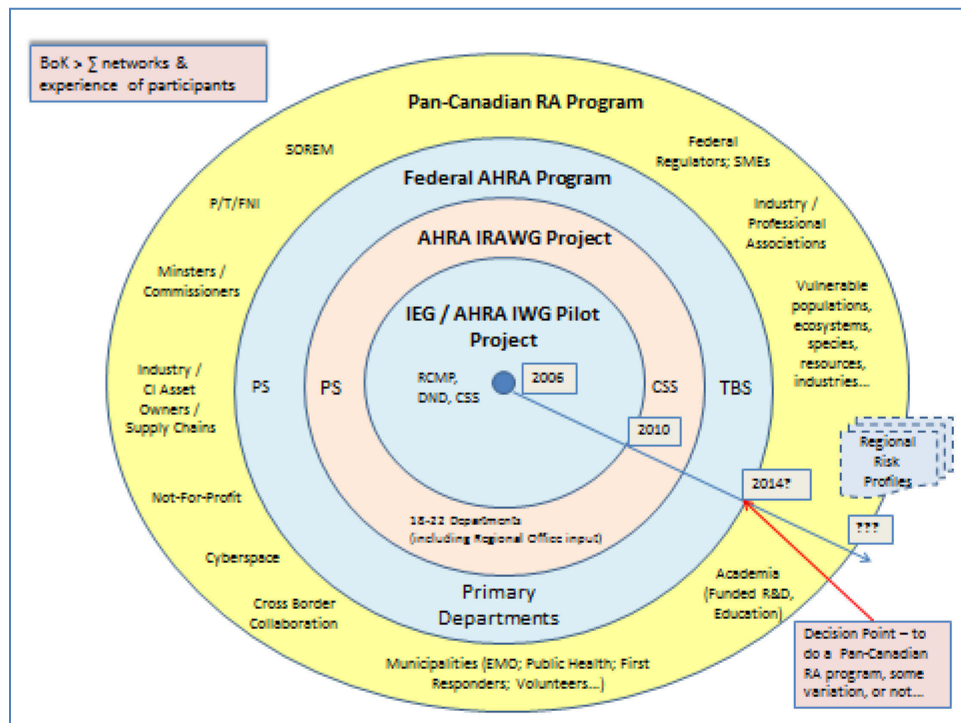
Figure 17: Strategic Knowledge Management Model

7.6   Supporting Activities

7.6.1   Strategic Management and Planning Framework

The AHRA Methodology Guidelines include an AHRA business process based on the federal fiscal year. A similar model could be developed for a NRA by implementing one or two regional pilot projects. While PS could retain the annual cycle for the federal AHRA activity, it will probably need to develop a different strategy, preferably including flexible funding mechanisms, to implement a NRA strategy. Unlike several nations that have already implemented national risk

assessment activities, PS does not have the same legislative or financial levers at its disposal. The NRA PIP or equivalent should address the major planning actors including: business case for full implementation preferably including multi-year financing; governance; and an information & knowledge management approach.

7.6.2   Scenario Management

Scenarios have become an integral and key part of federal AHRA methodology. Scenarios provide context and a framework for discussion. AHRA risk event scenarios describe the 'who, what, why, when, where and how' aspects of the decision making environment. The challenge moving to a NRA strategy is to capture scenarios that are relevant to each region in Canada. Scenarios should be included in the next version of the federal guidelines. Regional pilot projects would adapt the scenarios approach to fit a regional model for their top priority risks and capability deficiencies. The exploitation of scenarios is one way for regions to communicate their priorities to other jurisdictions and to explore collaborative and systematic approaches to risk treatment.

7.6.3   Science and Technology

CSSP employs rigorous processes to plan and prioritize its investments that support a whole-of-government approach to S&T support to the national safety, security and resilience portfolio. PS need to provide strategic planning assumptions and goals to support development of plans to provide continued S&T support to federal AHRA and NRA activities. Given CSS resource limitations, it is likely that if the NRA moves forward, then this would be the priority effort and CSS would have to shift resource from AHRA to the NRA.

CSS work on the cyber-security file found that PS had developed an inventory of funded research in academia across Canada. It is not known if such an inventory or with list exists for a broader safety, security and resilience framework. Canada has not managed the skilled resources for the broader requirements. Some people transition from security or safety domains into resilience work later in their careers. This implementation plan recommends that knowledge profiles be developed for some specialist areas as a start point for a strategic approach to resource management that does not exist today.

7.6.4   Cost, Benefit and Risk Analysis

A cost, benefit and risk analysis model that considers both the status quo (two-level centralized model with federal AHRA and ad hoc P/T risk assessment approaches), a regional model (AHRA continues as the federal model, but resources are shifted to support a regional model) and other options (e.g., stop work on AHRA). This methodology should also become part of the risk treatment section of the guidelines and an integral part of the capability assessment methodology.

7.6.5   Scope Management

An agile project requires adaptable scope management. For a NRA program to be successful, PS will need to form a dedicated project team with appropriate support. The team will need to define the vision, strategy, principles and objectives as a start point. Depending on the GC NRA

strategy, the team can assess options. The AHRA methodology showed that a pilot phase is useful to establish a baseline, develop relationships, and define the strengths and weaknesses of existing practices and capabilities. Initially, scope could be managed by doing one or two pilots in two regions with diverse risk problems.

A decision that was taken early in the AHRA work was to not consider critical infrastructure sectors. The national strategy should revisit this decision, and PS should be prepared to let regions take the lead. In the regional context, operational and CI risks are the main focus for capability investments decisions. Therefore, some adjustments in the overall methodology will be needed to include aspects of the assessment that were intentionally left out of the AHRA scope.

Examples of two other decisions that should be revisited are: the PS decision to focus on two timeframes - five years, and 5-25 years (i.e., when an event could occur, as opposed to when decisions are needed); and the PS direction to develop one "comprehensive and integrated" risk assessment technique for both malicious and non-malicious threats[53]. The latter decision is likely less important at the regional level. Regions would know their priorities, and they are likely more interested in the stakeholder impact analysis than estimates of likelihood or probabilistic approaches to predict when an event is likely to occur. Regions are more likely interested in answering such questions as, how bad could it be, and what is my capability to minimize the risk to the public, economy, infrastructure and environment?

7.6.6   Change Management

As the GC lead agency for the AHRA activity, PS requires a dynamic process to manage improvements to the AHRA methodology and take advantage of the IRAWG work. Feedback should be provided to participants throughout the annual cycle. Due to the widespread use of the AHRA methodology, changes should be centrally-managed with appropriate data management, communications and learning strategies.

The transition plan focuses on information gathering in two ways – lessons learned from organizations that have tried to implement or adapt AHRA, which goes beyond members of the IRAWG; and benchmarking to get a current snapshot of foreign national risk assessment programs, including new foreign nations that have experience in areas that are of interest to specific regions.

7.6.7   Risk, Issue and Opportunity Management

Continuous risk management is a mature methodology that is applicable to a NRA program[54]. Spiral Development is a proven methodology that is builds on success and learns from mistakes and proactive risk taking. It has wider applications including the implementation of complicated

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[53] AHRA Methodology Guidelines 2011-2012, PS, 2012: 3

[54] The Carnegie Mellon University, Software Engineering Institute is a federally-funded (US) research and development center sponsored by DoD. The Continuous Risk Management Guidebook (1996) is a useful project management resource along with PMBoK, agile, 6Sigma, LEAN and other techniques.

programs with many stakeholders, such a NRA.[55] As AHRA proved, a spiral model helps to keep people interested and to maintain momentum. It serves to select quick wins, while keeping the horizon in view.

7.6.8   Communications Management

PS will need to communicate with a broad audience in order to obtain useful risk profiles. Stakeholders include: all levels of government; critical infrastructure asset owners; not-for-profit and professional organizations; SMEs; and the public. A clear understanding of stakeholders is vital to gain insight into risks outside the federal jurisdiction. A start point would be to adapt the community mapping technique to gather information from P/T/FNI participants. However, to manage this effort, it is preferable to use a pilot project phase with one or two regions, and build from that information baseline rather than trying to tackle the whole nation. The value of this approach would include identifying regional best practices that can be shared with other regions and the federal level, which could yield more streamlined, participative and operationally-oriented approaches.

7.6.9   Collaboration

AHRA should employ a collaborative framework that helps to differentiate global knowledge within the federal network and regional knowledge of participating organizations and individual SMEs. The framework should consider attribution and non-attribution to promote open communications, when appropriate and to enable feedback loops and stimulate the best ideas. This activity would incorporate ideas from the automation support part of the CSSP-sponsored AHRA Transition Project (2012-2014), CSS and others' experience.

7.6.10   Information Protection

Classifying (labeling) and protecting sensitive information are necessary parts of an AHRA methodology. The transition plan includes a benchmarking activity that should identify best practices. This activity would incorporate ideas from the CSSP-sponsored AHRA Transition Project (2012-2014).

7.6.11   Performance Measurement Framework

The federal AHRA and a NRA will need to both develop capability performance measurement frameworks, possibly building on best practices in federal and regional authorities. The AHRA Methodology Guidelines should address this requirement in a future iteration.

7.7   Conclusions

A critical success factor appears to be to elevate the discourse and planning to the capability assessment level, and consider the AHRA body of work as a foundational building block for a

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[55] Sources: Spiral Development: Experience, Principles and Refinements, CMU SEI, July 2000; and Using Spiral Development to Reduce Acquisition Cycle Times, University of Maryland, School of Public Policy, May 14, 2008.

NRA. Merging AHRA with a broader capability assessment methodology may be a viable option to conserve resources and leverage the best of the best practices from both analytical concepts.

The implementation strategy presents a phased approach that reuses lessons from the AHRA Methodology that includes applying the problem space definition and community mapping techniques at a region levels. By adapting lessons from the AHRA activity, PS could produce a strategic plan for migrating to a NRA capability that can be used to produce and maintain a consolidated risk picture and a management view of capabilities across regions. This would not be an operational tool, but it could certainly be a balance of investment and strategic decision support tool. The next section of this report describes a transition plan that focuses on re-baselining AHRA, and analyzing lessons learned and benchmarks from other national programs With AHRA and NRA in mind. These activities would establish a foundation for advancing the federal AHRA activity and/or transitioning to a national strategy.

Next steps to consider include:

- Briefing notes and decision papers to launch one or two NRA pilot projects;

- NRA project implementation strategy;

- Re-baseline the AHRA methodology and building blocks, and add scenarios as a building block;

- Document the results of Cycle 3 scenario-based workshops;

- Document the scenario development process and include a section in the PS guidelines; and

- In collaboration with regional authorities, identify representative regional high priority scenarios, and develop a business case and plan to implement a pilot project phase, preferably starting in FY2014/15.

Decisions or direction likely include:

- Governance structure and the role of federal specialists;

- Multi-year commitment of resources; and

- Approval of one or two regional pilot projects (possibly combined with critical infrastructure work).

8 Transition Plan

8.1 Purpose

The section describes a bridging strategy between the implementation strategy and the exploitation plan. Whereas the next section takes a holistic view of AHRA body of work, the transition plan focuses on five areas to support future work for the AHRA, NRA and/or the DRDC CSS RACI Section work in support of GC priorities and the CSSP.

8.2 Background

The focus of the community of federal risk practitioners (i.e., IRAWG, departmental SMEs, etc.) is on implementing the scenario-based risk assessment methodology on an annual cycle. PS is also interested in implementing AHRA for other emergency management planning activities. DRDC CSS's interest is to promote convergence with the implementation of a capability assessment methodology that supports decision making across the safety, security and resilience domains.

8.3 Objectives and Scope

The objective of the transition plan is to describe activities that should be implemented in the next 6-12 months to review and refresh the AHRA information baseline including: update core products (lexicon, taxonomy, community mapping process and tools, scenario management framework, and documentation of the calibration technique); gather lessons learned from departments and agencies that have experience with the guidelines; and benchmark a few nations that have implemented national programs focusing on a few key issues including authority, governance and risk assessment techniques. A structured Transition Phase should enable a re-assessment of the AHRA as a methodology and as a risk assessment technique, and support convergence with capability assessment.

The transition plan focuses on five work packages described below. These tasks would contribute to decision support including: is it practical to attempt a strategic NRA activity in Canada at this time; what is needed to ensure success; and where should S&T resources focus attention considering CSSP resource limitations and workload.

8.4 Challenges

The main challenges with implementing this transition plan are that: departments have limited time to focus on this area in addition to the existing workshops; there are many ongoing activities to address central agency EM planning requirements; and attempting to implement an NRA activity may be perceived as too complicated and 'a bridge too far' with respect to achieving the EMA. Additionally, it is also not known how receptive other levels of government, the private sector and other stakeholders would be to implementing the NRA concept, especially, if the governance and funding models are ambiguous. Much depends on whether people think that existing jurisdictional efforts making progress now, and whether these activities would benefit

from a more strategic approach. Creating a business case for a strategic NRA activity in Canada remains a challenging prospect.

8.5   Assumptions

The main assumption that drives this transition plan is that there will be convergence with capability assessment in the next 6-12 months. Other assumptions include:

- PS will continue to use the AHRA framework as the basis for federal scenario-based risk assessments, the EMPG and other initiatives;

- Refreshing the AHRA baseline is a logical next step to capture lessons learned and new ideas from the federal workshops;

- Limited federal funding can found to support a NRA pilot phase of up to one year as a first step;

- If the NRA does not proceed, then there will still be opportunities for PS and CSS to advance the methodology and techniques to support other initiatives; and

- Development of systematic approaches to lessons learned and benchmarking are worthwhile activities in the near-term, even if the NRA does not proceed. These inputs have not been refreshed since 2010, which means that people may try to adopt models that are not appropriate for Canada.

8.6   Findings

The transition plan is based on the preliminary WBS below (Figure 18). It is envisaged that this phase could be achieved in parallel (or combined) with the initiation and planning phase of the implementation strategy, and that it would likely take 6-12 months. Detailed planning depends on the GC vision and an option analysis.

8.6.1   Work Breakdown Structure

This section summarizes five work packages. Completion of these activities should precede a final decision on whether to implement a comprehensive NRA concept or to try to build on the existing federal approach. It is envisaged that a pilot phase should precede the decision for full scale implementation. This plan includes the effort to plan a pilot phase consisting of one or two regional pilot projects.

Transition WBS

Transition Phase

Planning

- Business Case for full implementation - including mechanisms – EM Act; financing – Grants?; IM/IT environment
- Program Option Analysis
- Relationship management (MOU's?)
- Terms of Reference
- Governance framework
- Refine toolkit
- Website (AHRA library; part of PS Digital Library?)
- Project Plan for pilot project – regional risk profile
- Update PIP including plan for IKM, information security…
- Develop program risk management plan

Lessons Learned

- Update BoK
- Gather lessons using AHRA from various sources
- LL Report (federal only but including regional office inputs…)

International Benchmarking

- Analysis of current state of foreign national programs and plans looking out 3-5 years
- Best Practices Report
- Forecasts…

Regional Community Mapping

- Extend PS (GC) R&D inventory to include EM, risk management and resilience (academia)
- Identify research gaps (e.g. cognitive dissonance; System Dynamics…)
- Gather information from P/T/FNI; CI sectors;…
- Regional Community Maps Report / DB
- Report on P/T/FNI Risk Perception and maturity
- Program Risk Assessment
- Initial performance measurement framework

S&T / OR / R&D

- CSS AHRA Transition Project Report
- Refine alignment with CBIM - plan
- S&T / OR Road Map
- Re-baseline Architecture
- Review P/T/FNI inputs ;Regional gap analysis; Regional Hard Problems Lists
- Scenario management tool
- OR techniques information kit
- Benchmark Regional risk assessment techniques
- Build Regional toolkit
- Research on visualization
- Continued OR and architecture support; input to TCL-C
- Plan for foresight capability
- Input to IKM plan, information security, collaboration…
- Review state of PS R&D inventory – risk assessment, EM & resilience
- Technical Papers, regional conferences…
- In put to CSSP Calls

Figure 18: Transition Work Breakdown Structure

8.6.1.1 Work Package 1 – Planning

This package includes consolidation of outputs of the AHRA Transition Project, and inputs from other parallel activities including: National Enterprise Risk Management; Emergency Management System; updates of the Federal Emergency Response Plan, EMPG and AHRA Methodology Guidelines; and reviews to various national strategies and action plans.

Transition could include support to PS to develop a business case for the NRA concept. It could also include the project plans and support for one or more pilot projects to validate the NRA concept, define the regional problem spaces, develop NRA planning assumptions and planning objectives, and produce prototype regional risk and/or capability profiles. Such profiles could be for one or more of the safety, security and resilience domains, or focused on the top "n" scenarios. To scope the planning effort, it is envisaged that three workshops would be needed (specialist; operations managers and asset owners, and public and private sector executives). These workshops would be relatively close together but not consecutive. Therefore, there are cost implications. It is also envisaged that regional authorities would take the lead and federal SMEs would support the workshops.

8.6.1.2 Work Package 2 – Lessons Learned

The information baseline should be updated based on lessons learned from the risk federal workshops and departments' experience implementing or adapting AHRA for other purposes This task would produce a lessons learned report.

Inputs could include:

- Lessons from the IRAWG participants (Cycle 3);

- Federal risk practitioners' experience with implementing and adapting the AHRA Methodology Guidelines [e.g., in conjunction with implementing the EMPG];

- How departments are using risk assessment techniques to implement existing mandates, and national strategies and action plans, such as critical infrastructure protection, perimeter security and the National Disaster Mitigation Strategy; and

- Identification of trusted sources for strategic analysis (e.g., CDA Institute, Conference Board of Canada, Federation of Canadian Municipalities, etc.).

8.6.1.3   Work Package 3 – International Benchmarking

This task would determine how Canada's program compares to assessments in other countries. Although Canada's structure and legislative situation are different from other nations, there are also similarities, and the benchmarking activity would focus on the areas of most value.

Some analysis has been done on the NRA practices of other nations. A next step should be to refresh the information baseline on relevant foreign NRA programs. Allied nations and other organizations may also be willing to share more information than is available in the public domain, but this would have cost implications for face to face meetings and to take advantage of international conferences. A challenge here is that the conferences tend to break down by risk domain. Therefore, the best option is probably that a PS and CSS team visit to the NRA program offices.

8.6.1.4   Work Package 4 – Regional Community Mapping

Building on AHRA experience with horizontal mapping of practices, this task would capture evidence from regional authorities. Trying to do this for all regions would be very labour-intensive. An alternative approach would be to focus on specific regional pilot projects and specific scenarios that are high priority for the regions. Adding a few days on the workshop activity would accomplish this task assuming that the people ask the right questions.

The figure below illustrates the concept of the information collection and relationship building activity that should describe the strategic problem space and provide a good indication of the strengths and limitations of the existing regional approaches, including their risk assessment practices and capability maturity. For example, a pilot project with BC would engage SMEs from adjacent US states. There would be many lessons from 2010 Olympics that would support the planning phase. Similarly, it is understood that Atlantic Canada uses a collaborative EM approach that engages stakeholders from across the region and in the adjacent and other states.
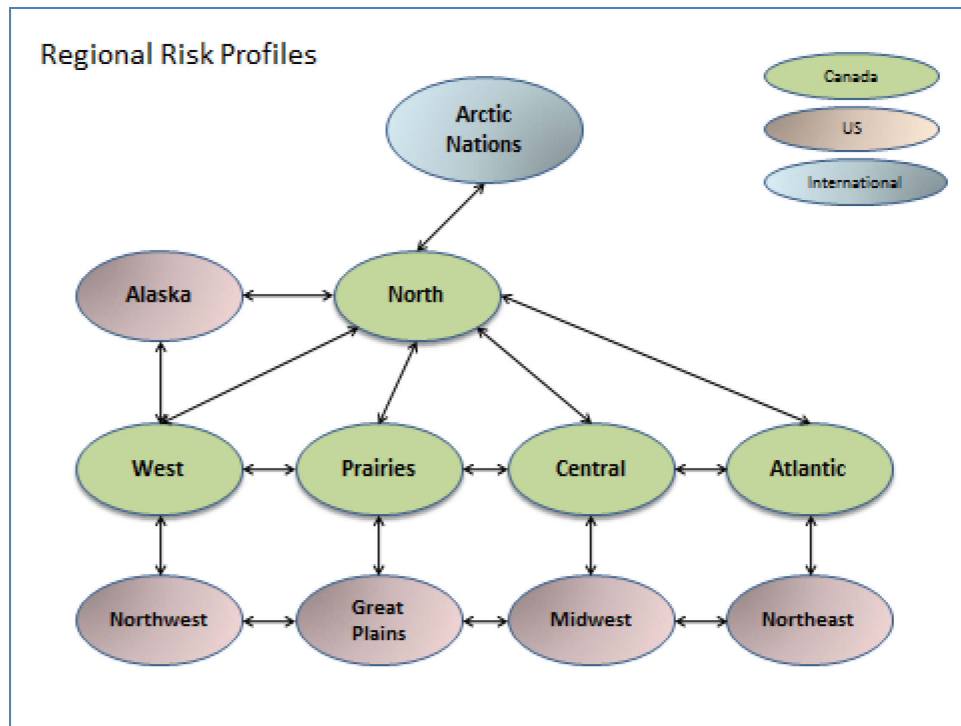
Figure 19: Regional KM Model

8.6.1.5   Work Package 5 – Research, Science and Technology

This task would include a rapid gap analysis of emerging CSSP Calls[56] and responses to identify opportunities to exploit lessons from AHRA and regional projects. Examples include:

- **AHRA Transition Project**: Synchronize AHRA with the capability assessment methodology, automation support (data management) and strategic asset management concepts, and emerging PS initiatives including national EM System and National Enterprise Risk Management;

- **Architecture Frameworks**: Initiate work on AF Measures of Effectiveness in support of the capability assessment methodology (and broader DoDAF/DNDAF direction); identification of opportunities arising from the application of architecture to the IRAWG workshop outputs; and input to benchmark analysis of other nations' use of architecture (for EM capability assessment); and

- **OR**: Specialist advice on taxonomies for impact and consequences; advice on risk visualization (human factors and ergonomics); support to a pilot projects ; determination of how to link NRA to a Target Capabilities List – "Region"; recommendations on a decision support tool set for the .federal and regional specialists and decision makers.

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[56] Call is the CSS term for request for proposals.

8.7   Supporting Activities

The following activities complement the transition phase.

8.7.1   Re-baseline AHRA Framework

The implementation initiation and planning phase should include updating the lexicon, taxonomy and other tools based on this report and feedback from the federal workshop participants and others that have experience with AHRA methodology and/or risk assessment technique.

8.7.2   Convergence with Capability Assessment

DRDC CSS has extensive experience with capability assessment at the municipal and first responder levels, including working with cross-border authorities and specialists. In theory, this knowledge can be scaled up to support strategic objectives for safety, security and resilience. Capability management was first applied in the military and emergency management fields, but it is being applied elsewhere including in industry. Availability, suitability, flexibility and reliability are attributes of safety, security and resilience capabilities.

The purpose of capability assessment and management is to consider all aspect of a potential risk event scenario. One technique is to consider the incident temporal continuum. In PS documents, the phases include: Prevention/Mitigation, Preparedness, Response and Recovery. For example, in the Response phase, an objective would be to improve the capability and resilience of the first responders and other responding organizations, including when they are victims. By applying a combination of risk and capability assessment techniques, GC and others would be able to identify and assess the capability and capacity of the as-is and to-be resources to complete the mandated mission.

8.9   Conclusions

The transition plan identifies tasks to update the federal AHRA information baseline that would also support a decision on if, when and how to implement a NRA. The transition plan focuses on a direction rather than a solution that would be tailored to suit Canada's federal concept and shared responsibility model for emergency management.

All regions in Canada face the common challenges of developing a balanced investment strategy that addresses known deficiencies and that anticipate future requirements. A comprehensive and strategic approach to risk and capability assessments should be attractive to all regions in Canada provided it balances investment between levels of government and not just among regional stakeholders. The challenge is to build on the federal AHRA and critical infrastructure experience, and DRDC CSS understanding of capability-based planning and other models, and to take the next step, which intuitively is to leverage regional experience and intimate knowledge of risks in their geographic areas.

9   Exploitation Concept

9.1   Purpose

The section contains an exploitation concept. It takes a holistic view of the federal AHRA work to anticipate what should contribute to developing a set of tools for risk assessment specialists and managers to improve the existing AHRA methodology, to contribute to the field of risk assessment practices in the public sector; and/or to potentially support migration towards a strategic NRA concept. The horizon for exploitation is the next 2-4 years, which includes some assumptions about convergence with other activities within the PS AHRA implementation and the DRDC CSS AHRA Transition Project.[57]   It is intended that the ideas presented below would be relevant for supporting the decision to implement a 'made-in-Canada' NRA capability that is achievable, affordable and sustainable.

9.2   Background

The AHRA framework is derived from the security risk management domain. Its original aim was to provide practical tools for military and law enforcement risk specialists to be able to assess threats to domestic security as one input to multi-dimensional decision making related to planning, prioritization of actions and strategic investments. It was intended to facilitate communications across the two distinct domains within the overall security and intelligence regime – policing and national defence.

The GC investigated whether common frameworks could be applied to other aspects of safety and security within an emergency management framework. As part of this process, personnel in DRDC CSS applied lessons from its Consolidated Risk Assessment (CRA) methodology that was developed to consider CBRN[58] threats and hazards; the emergency management capability analysis work at the regional and local levels; operations research and SME support of major events (2010 Winter Olympics, G8, G20); and other activities.

The original AHRA framework was based on three foundational building blocks: a common lexicon, a threat / hazard taxonomy[59] and a community mapping compendium. Since 2010, however, refinements have included: more proactive engagement of senior management to identify priorities for the annual cycle; the use of risk event scenarios; techniques for displaying risks including a means to compare malicious and non-malicious risks; and a six-level impact assessment framework.

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[57] The AHRA Transition Project includes: the BoK; capability assessment methodology; data management, which are all relevant to an emerging NRA concept.

[58] Chemical, Biological, Radiological, Nuclear (and Explosives added on partly due to experience in Security Engineering, Enhanced Blast Weapons, Afghanistan, Air India and initiatives like Air Cargo Security).

[59] This term is used because the taxonomy is not homogenous risk taxonomy. At the time, it was envisaged that other taxonomies would be developed including, but shortages of resources and other priorities precluded these next steps. The main gap is impact and consequence taxonomies.

Moreover, DRDC CSS established the AHRA Transition Project under the CSSP TI funding vehicle to review the information baseline and to suggest areas for improvement or further analysis to advance the federal AHRA and preferably, to transition to a NRA concept. This report achieves a balance of reviewing historical information and focusing forward on a NRA strategy.

9.3   Objectives

The exploitation concept objectives include: to summarize the findings from reviewing the most relevant documents in the CSS library; to present ideas for exploitation and to stimulate dialogue; and to support convergence of ongoing PS and CSS initiatives, and collaboration with regions. Another objective is to summarize systemic issues and challenges, and to present strategies to address them and move forward.[60] The scope of the exploitation strategy is unbounded. However, it is recognized that there are practical limits to exploitation that include: policy and authority levels; federal governance models; availability of subject matter experts; and procurement, financial and IT capabilities.

9.4   Challenges

There is a risk that the work on exploiting the AHRA will not progress quickly because it is perceived to be overly complicated or inconsistent with existing structures and cooperative arrangements. Decision makers may not see the value in expanding the AHRA to encompass regional taxonomies and risk profiles compared to other programs and priorities that address mandate-specific risks. There is another scenario, which is that federal senior managers put too much faith in the *status quo* – preferring to continue developing scenarios and analyze risks versus trying to combine separate views of risk at the federal and P/T levels based on a federal risk perception in consultation with regional authorities. However, this *status quo* would not put the responsibility for leadership where it belongs - with the regional authorities. A major disadvantage of this 'low risk' approach is that it does not capture, leverage or build on the knowledge in the federal, regional and local levels.

There are risks associated with engaging external stakeholders, but there are greater risks in not engaging them. Part of the conundrum involves the subject of risk ownership, which is referred to in the AHRA Methodology Guidelines and discussed more generally in the GC risk management documentation. Within an integrated, comprehensive and all-hazards framework, risk ownership is a flawed way of thinking about risk. In this compartmented mental model, risk is transferred to other jurisdictions or organizations as part of a broader 'risk avoidance' strategy. Although this might be a sound strategy for minimizing financial liability, this approach does not work in safety, security and resilience domains because they are fundamentally shared risk environments involving all stakeholders.

P/T/FNI, industry and other stakeholders have unique understanding of the risks in their areas of influence, including risks that ignore organizational mandates and geographical boundaries. Many provinces already assess risks in collaboration with other provinces and bordering US

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[60] The term "preliminary" is used because the BoK team did not consult with PS or other stakeholders. Many of the observations are based on best judgment with some validation by CSS specialists.

States. Leveraging the AHRA knowledge in combination with regional understanding or risks, and adopting a strategic approach to risk-based capability assessment will add value to all stakeholders. Furthermore, it will help to mitigate the risk that decision makers on all levels are making investment decisions on incomplete or inaccurate information, and/or invalid assumptions.

Other challenges include timing considerations: when will the DRDC CSS activities converge and be stable enough to support a national model; how long will it take to update the AHRA foundational building blocks; when decisions and resources are needed to allow planning and ramp-up; and are other jurisdictions willing and do they have the capacity to participate in this initiative, preferably by assuming a leadership role with financial and other GC support?

A snapshot of challenges and assumptions for a regionally-based NRA approach is presented below in Table 7. This exploitation concept was developed with these challenges in mind.

Table 7: National Risk Assessment Framework Challenges and Assumptions[61]

Management Layer	Challenges and Assumptions
Strategy	• EM Act (focus is on mechanisms for P/T to request assistance during and after incidents. It does not provide PS with authority, tools and mechanisms to be proactive) • Existing governance models are reactive • A new participative governance model is needed based on regional models
Program	• PS has many "national" strategies and action plans in its portfolio. However, a major challenge is achieving a balanced approach to investment since these strategies are separated in time, priorities are dynamic, and relevant performance metrics do not exist • An agile program management approach and a workable technology strategy are needed to build and sustain momentum. PS could exploit lessons from CSSP • PS is building a picture of federal risk perception based on scenarios, but much depends on who is estimating the risk exposure and evaluating the treatment options. Achieving a balance of specialist, operation and executive perspectives is a challenge that requires an iterative approach • Departments with regional offices can add value from their perspective of "regional" challenges, but this would not achieve a regional viewpoint that could be consolidated into a national framework • Getting P/T/FNI to do regional risk workshops that produce regional risk profiles is complicated. P/T stakeholders may not be receptive based on past experience, lack of resources capacity and/or competing initiatives • The federal AHRA activity is planned and funded on a FY basis. A NRS requires a multi-year commitment even though the outcome is uncertain
Operations	• To achieve an operational perspective requires participation by municipalities, communities, industry, NGOs and other stakeholders, including adjacent P/T or US states • Past AHRA work intentionally did not consider critical infrastructure or risk treatment to be in scope. However, at the regional level, these areas are the centre of gravity for decision making. The AHRA could be

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[61] PS may have strategies that address these challenges, but the BoK did not include consultation with PS.

Management Layer	Challenges and Assumptions
	extended to include treatment, and AHRA could merge with capability assessment. There needs to be a level of certainty that there will be tangible results from participating in a NRA • Threats and hazards are reasonably well understood with the exception of adaptive threats, which requires a dedicated focus within the S&I community in its own right. • What are less well developed are consistent ways to compare investment options for other risk domains including: Transnational Organized Crime; environment; natural resource protection; and health Risk differentiation and treatment prioritization techniques at the regional level may be different from the AHRA technique. Opening the door to other decision support techniques should benefit all stakeholders • The emerging set of federal scenarios may not be adaptable or relevant for regional risk and/or capability assessment workshops. Regions know their risks, and lesson from the federal work can add value by improving consistency and providing criteria to support analysis and decision making
Management and Administration	• Engaging senior management is important, but building risk profiles should not be top-down. Senior managers should be engaged once there is a sound description of risks and treatment strategies . Executives should focus on treatment • Mechanisms are needed to engage SMEs • Data, information and knowledge management is complicated. There may be solutions in regions that GC has not considered information protection is a challenge. The process must cater for classified workshop from some risk domains, and information protection

A rapid scan of the US strategic national risk assessment (SNRA) program found a National Academy of Science report that summarizes the decision making environment as indicated below. The quote is presented in its entirety because it is relevant for Canada. The deduction of their study is that political will and strong leadership are the essential challenge, and this report suggests, the primary lever for success.

> Enhancing a nation's resilience to hazards and disasters is a laudable aspiration, but as is the case with such lofty goals, the devil is in the details. Although few would argue about the needs to enhance the resilience of the nation and its communities to natural hazards, conflicts arise over how to move toward enhancing resilience, how to manage the costs of doing so, and how to assess its effectiveness. As we have seen, the costs of disasters are increasing as a function of more people and structures in harm's way as well as the effects of the extreme events themselves. These costs are being incurred at a time when more and more communities are financially constrained and unable to pay for essential services such as public safety and education. The choices that local communities have to make are this difficult and not without some pain. At the same time, federal, state, and local governments have their own sets of constraints in terms of budget priorities, national interests, aging and declining infrastructure, and the political realities of implementing the kinds of changes needed to increase resilience. Disaster resilience may not be on the forefront of a political or institutional

agenda until a disaster strikes one's own community. Political will and strong leadership are therefore essential to build resilience at any level. [62]

It is noteworthy that in January 2013, DHS raised the issue of insufficient authority to achieve what are clearly set out objectives (Presidential Policy Directive 8). In the Canadian context, a pilot project phase can overcome most obstacles by finding innovative ways to make the NRA work. The AHRA lessons from a concept-based, iterative and spiral development strategy including a pilot phase are directly applicable to the NRA.

9.5   Discussion

The analysis does not pre-judge the way forward for a strategic NRA activity. There are numerous ways that public officials already develop a snapshot of risk exposure for their areas of interest and influence. For example, law enforcement, health and natural resources specialists work closely with other levels of government and international bodies, including industry SMEs. The problem is that this knowledge is fragmented and difficult to harness to support balanced investment strategies for the full spectrum of safety, security and resilience[63] capabilities across risk domains. An objective of the transition plan (section 7) to capture success stories, and build on success in a forward-focused way that embraces risk and manages uncertainty.

An example that should be relevant to NRA is in the health domain. It is generally accepted that the challenge is not to provide the same level of service to all populations. The challenge is to provide the right services for the target population in a timely manner. A similar concept should be relevant for resiliency planning, but this requires a shift in risk assessment thinking from the dominance of threats and hazards, to a balanced approach that considers the potential impacts from multiple stakeholders' perspectives.

To help shape this exploitation concept, a preliminary option analysis was completed based on the documentation review and best judgment (Volume II, Folio 10). Three options were considered: a federal-led initiative that develops a risk picture based on its risk perception, and then engages P/T stakeholders to validate its judgment; a region-led strategy supported by federal funding and SMEs; and a hybrid approach. A bottom-up model was not considered as it would lack consistency and it would be integral to a regional approach up to that level anyway. The major assumption is that if any of these models were chosen, a streamlined approach would be needed to quickly gain traction and support including identification and action on quick wins.

The value of a NRA concept is more than improving visibility of risks and gaps in risk treatment strategies. It would include the ability to dynamically share information and collaborate. Currently, this networking occurs during incidents, and at numerous conferences and associations that usually focus on elements of the problem space. Being able to re-apply lessons across jurisdictions and risk domains should be a strategic benefit and 'selling' feature for all stakeholders. The ideas for exploiting the AHRA are grouped into five themes:

1. Knowledge domain (and risk/capability assessment as a decision support capability);

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[62] National Academy of Sciences, Disaster Resilience: A National Imperative The National Academies Press (Washington: National Academies Press, 2012), p. vii.
[63] Resilience refers to societal resilience, which includes EM, CIP and other dimensions of the capability.

2. AHRA concept-based approach;

3. Methodology;

4. Techniques; and

5. Supporting systems.

Each of these five themes is discussed in the following sections.

9.5.1   Knowledge Domain

The implementation strategy includes an activity to define knowledge profiles for risk and capability analysts, architect and OR specialists, amongst others. This idea presumes that PS and/or P/T authorities have also recognized the need to define knowledge profiles for emergency management specialists. Figure 20 presents some initial thoughts on relevant knowledge areas from both risk specialist and decision maker perspective. The model is intended to reflect knowledge areas that are applicable to the NRA and societal resilience concepts.
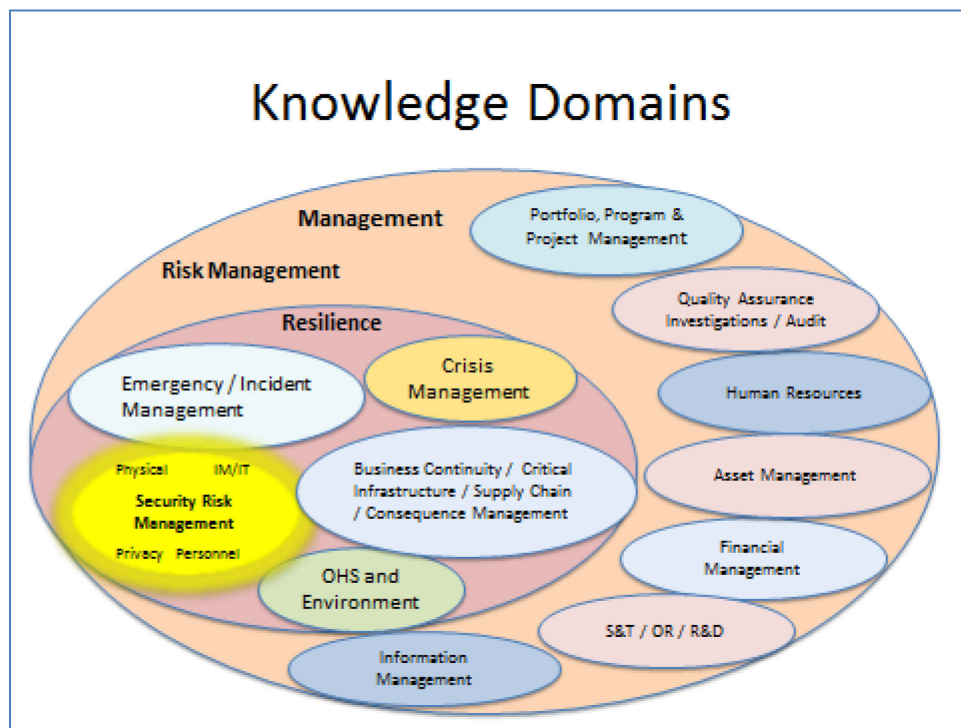
Figure 20: Risk & Capability Assessment Knowledge Management Model

One way of looking at AHRA as a (management) capability is illustrated in the spider (capability maturity) diagram below (Figure 21). The tool can be used to show elements of the capability and their maturity, which in turn can illustrate systemic constraints and potential areas for

management intervention. In this case, the limitations are not a case of maturity; it is a case of resource capacity and procurement constraints (i.e., time and effort to contract private sector resources). In this model, the four areas that are limits to success are architecture; futures, foresight and trend analysis; capability management (which is not a mature process in federal or P/T organizations); and data, information and knowledge management (e.g., technology, information security, procurement and learning curve constraints).
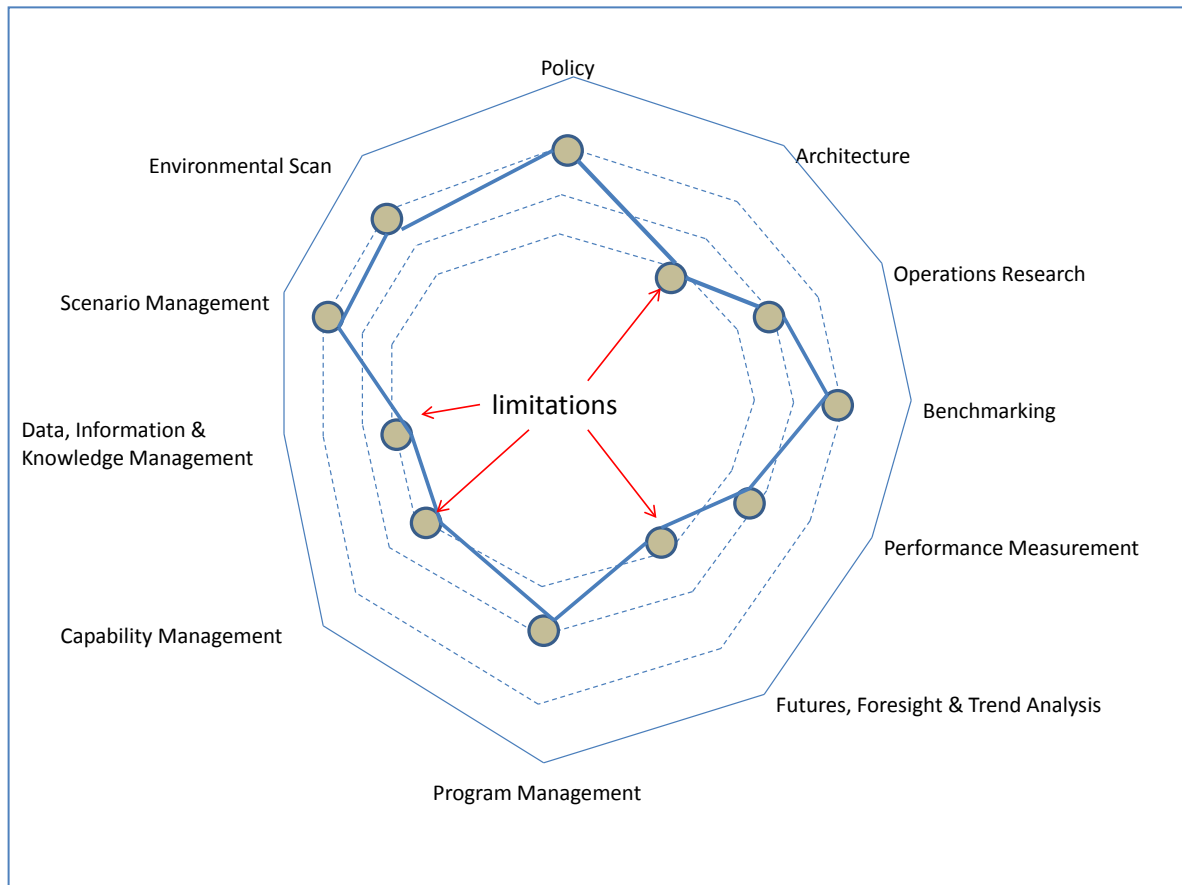
Figure 21: National Risk Assessment Capability Maturity Model

9.5.2   AHRA Concept

There are several aspects of the AHRA concept that can be exploited to contribute to an NRA concept including: spiral development methodology; foundational building blocks; national planning scenarios; convergence with capability assessment; and understanding of the challenges. It is assumed that regions already know the high risk scenarios in their regions. Therefore, less time is probably required focusing on threats and hazards, and more time could be spent on understanding impacts and consequences, and organizational, technology and other interdependencies.

9.5.2.1   Problem Space Definition

The AHRA problem space was initially described as one coherent space facing the development of the concept. AHRA has evolved to the point where departments continue to gain insight into the individual high risk scenarios, mandate-focused risk domains, and the interaction among risks that cross mandates. Building on this knowledge, GC will need to be ready to support regions to develop/refine the appropriate techniques and design a streamlined NRA approach that focuses the right resources on the right risks.

9.5.2.2   Centralized, Decentralized and/or Hybrid Management Models

The safety, security and resilience landscape is a combination of centralized and decentralized constructs, which makes it complicated to govern and introduce a unified capability assessment framework. At the federal level, PS provides leadership and a coordination role within the federal government and with P/T partners, but responsibility for operational risk management resides at the departmental level. A corresponding model exists at the P/T level with individual departments having responsibility for risk management within their mandates, and municipalities having the responsibility for operational risk management.

The nations that PS and DRDC CSS have considered as management models have centralized approaches with legislation, clear government direction, authority, funding and other levers to be able to execute a centralized NRA model.[64] However, to implement a NRA concept, Canada probably should use a flexible governance strategy that works for all levels of government, preferably with some funding levers. At the time of the writing, it is not known if PS has analyzed options for implementing a NRA. A hybrid model should work, but it will probably take a few iterations, and a participative leadership model to make it work.

9.5.2.3   Logic Models and Management Frameworks

DRDC CSS created the following preliminary model to depict 'building a NRA framework.' It is included here as a reference point for future work. A benchmarking activity should identify regional examples, and construct a framework that works for a decentralized regional implementation concept.

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[64] AHRA considered US, UK, AS and NL NRA models.

Building a National AHRA Framework

Objectives | AHRA "Work Packages" | Tasks & Activities

Develop an optimized set of National Planning Scenarios for malicious and non-malicious incidents

Develop a National Risk Assessment that identifies the threats/risks to public safety and security in Canada

Clarify federal, P/T and local planning assumptions and authorities

Develop a National Risk Register that promotes common understanding of risks at all levels

Design a national risk management structure that enables and informs global risk governance

National AHRA Framework. Pilot expanding the AHRA beyond federal community to include P/T's and/or regions

Capability Assessment. Pilot the development of a capability assessment approach for the AHRA process

Regional & P/T Risk Assessments. Determine if expansion of National AHRA Framework will enhance ability to produce regional and P/T risk assessments

Consolidated Risk Picture. Determine if aggregating risk information will provide comprehensive picture to facilitate planning and decision-making

Process. Design a national AHRA structure and associated process with allowance for P/T and municipal input

Data & IM Strategy. Explore on-line and automated tools, approaches and repositories to support National AHRA Framework

Streamline and automate the federal AHRA process

Expand AHRA Framework to incorporate regional and P/T assessment and capabilities

Enhance direction for Strategic Emergency Management Plan

Develop best practices and common tools that support sector risk assessments (e.g., Health, CIP, etc.)

Design performance measurement framework

Friesen, S., CSS, Jan13   DRAFT FOR DISCUSSION PURPOSES ONLY
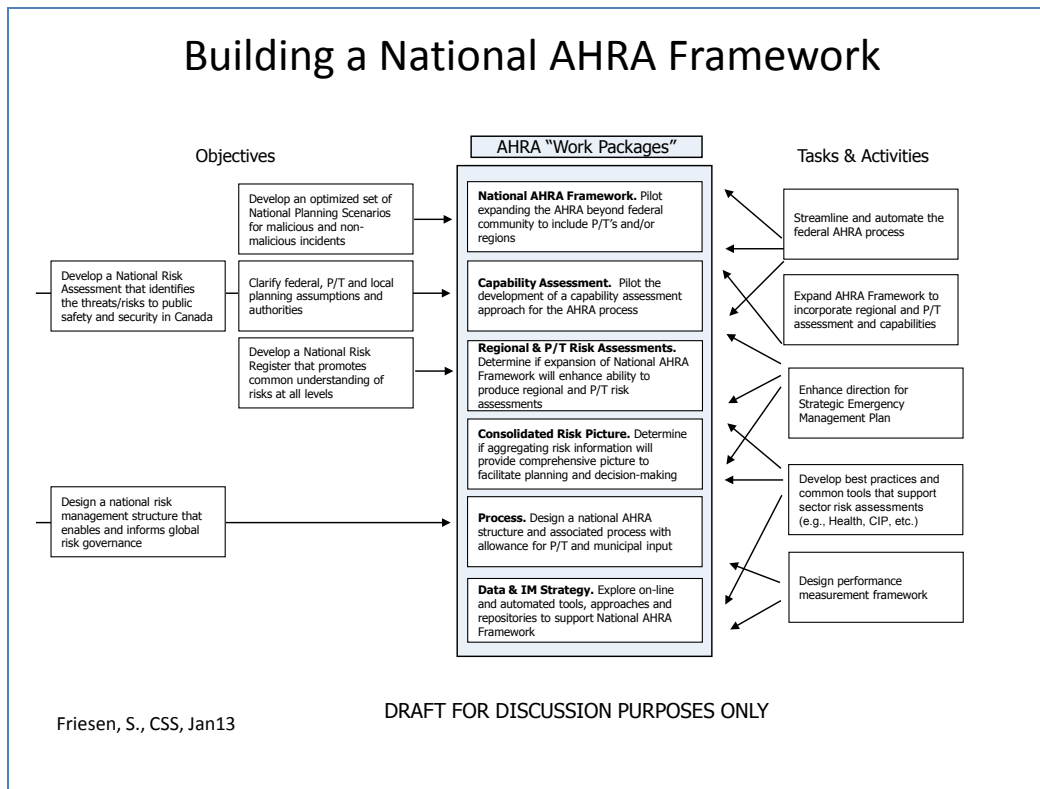
Figure 22: Building a National Risk Assessment Framework

9.5.2.4 Language and Terminology

Just as the AHRA work started by clarifying terminology, this exploitation concept considers some adjustments to a few terms. These suggestions would need to be validated. Regarding terminology, this chapter uses different terms in an attempt to clarify meaning, address some known ambiguities and to identify next steps. An overview of potential adjustments includes:

- Consider risk assessment as a process to 'differentiate' risks;

- Consider risk treatment as a process to 'prioritize' risk treatment actions;

- Consider AHRA as a methodology that uses a multi-criteria risk assessment technique;

- Consider that the valuable output of the IRAWG workshops is a set of scenarios that can be adapted or used as a benchmark the NRA. That is, while the output of the assessments themselves is valuable, it is the process that offers the most value. Assessments are snapshots in time that rank the relative severity of the risks being assessed by a specific group at a time. They are subjective assessments that exploit mathematical techniques to differentiate the risks; and

- Consider that risk management techniques contribute to all aspects of capability assessment (decision making), and that AHRA should merge with the capability assessment methodology.

9.5.2.5 AHRA Framework Future

DRDC CSS work will need to consider two minor adjustments to the AHRA framework:

1. The methodology should consider a variety of analytical techniques; and

2. The focus should be on a modified risk management model that applies risk management thinking and techniques to assessment, estimation and evaluation.

In the framework below, risk assessment is shown within the overall risk management process and methodology. The AHRA is currently focused on risk assessment, whereas capability assessment embraces risk evaluation. Figure 23 illustrates the AHRA risk management lifecycle.
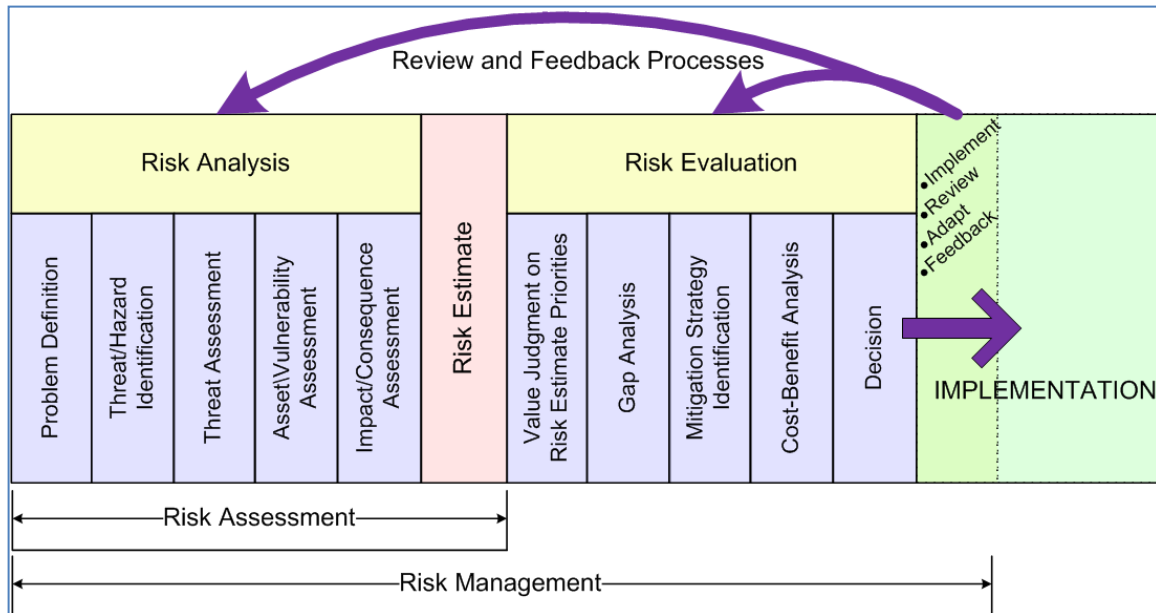

Figure 23: AHRA Risk Management Model (CSS, 2009)

In terms of the overall AHRA risk management mode, the following adjustments need to be considered to extend the reach of the assessment techniques:

- Elevate and extend analysis to include assessment, estimate and evaluation (i.e., a higher level than evaluation);

- Consider all-hazards as a concept, methodology and framework, and treat the actual risk assessment as a multi-criteria risk assessment technique, which opens the door for other risk assessment and decision support techniques;

- Add 'scenario prioritization' prior to risk estimate, and after impact and consequence assessment;

- Remove forward slash ("/") between impact and consequence. They are not the same thing and it is not an either/or determination – both are required, so include the "and";

- Add stakeholder analysis before "impact and consequence analysis" to make it an explicit part of the risk assessment process;

- Insert "capability assessment" in lieu of gap analysis;

- Change mitigation strategy to "treatment strategy", which is consistent with the generally-accepted international term (that emerged after this model was created);

- Add calibration as part of the evaluation technique, possibly replacing "value judgement…", which is a vague concept and not a discrete process, and add "prioritization" before decision; and

- Missing from the model is the risk management plan. The "review and feedback process" should also point to a risk management plan.

The 'all-hazards' concept has been applied in the emergency management field since at least the early 1990's as a means to help asset and capability managers develop affordable plans that would address multiple hazards. The application was focused mostly on natural disasters, technological failures and accidents, and human-caused disasters. The game changer was terrorism, which took on new emphasis in the US after 9/11, and has had cascading effects on the federal AHRA.

In parallel, the natural and technological disaster landscape continues to change, and nations and organizations are focusing more effort on resilience. That is, the ability to recover from any significant situation and to be able not only to 'bounce back', but also 'bounce forward.' Internationally, various groups of specialists are applying resilience concepts from the first responder to a societal and indeed global level (e.g., techniques include business continuity, continuity of operations and disaster risk reduction).

9.5.2.6   National Risk Assessment

The writing team considered the term *pan-Canadian risk analysis concept* for two reasons. The term, pan-Canadian might minimize the perception that an NRA activity depends on a top-down, federally-managed process, and/or the provision of federal resources that may or may not be forthcoming. Also, the term 'activity' is used instead of program, which can cause resistance because of perceived resource demands. The term "consultation" was not used because this can suggest protracted processes of indeterminate duration and uncertain outcomes. The NRA should be managed with the long view in mind, including commitment of multi-year funding.

The following model (Figure 24) represents a flexible concept that builds on the existing regional knowledge base and networks including with cross-border governments and industry

business/asset owners.   The primary outputs would be regional and eventually critical infrastructure sector risk profiles that would include analysis of assumptions about support from other organizations or jurisdictions, and associated vulnerabilities.
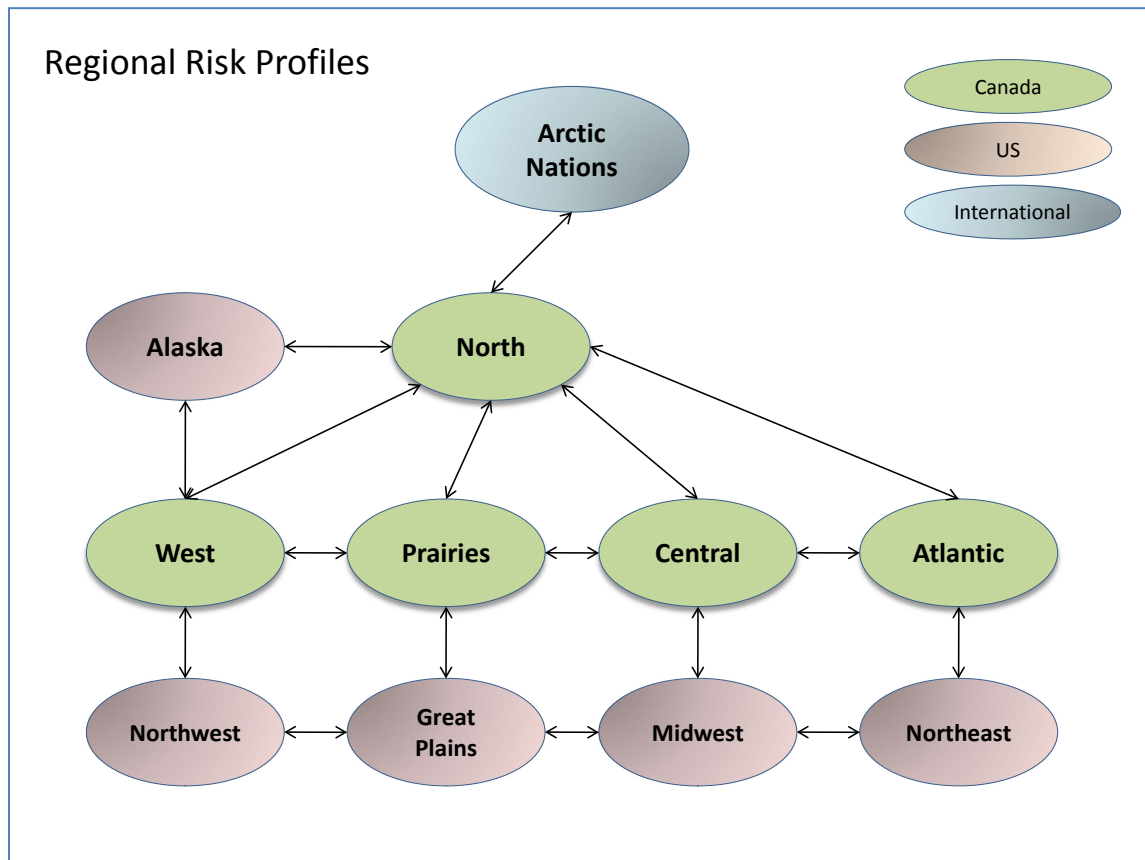

Figure 24: Regional Risk-Based Capability Assessment Model

Figure 25 presents another preliminary draft concept for aggregating information in an NRA construct, which is predicated on a regionally-oriented approach to risk assessment and emergency management planning. The central idea is that past approaches to EM planning within Canada have been predicated on a silo approach to risk assessment and risk management, whereby P/Ts produce their own assessments that are then managed by the local jurisdiction or at the P/T level.

Of note, the risk environment in Canada is different than many other countries (e.g., US, UK, Dutch, etc.). It is a fractured environment, with responsibilities divided between federal authorities, P/T governments and municipalities. Regulations, legislation, policy, and codes (for instance) specify certain functions and duties for assessments and studies, and risk assessment is usually incorporated into any similar provincial/municipal legislation or as part of EM plans. Where legislation exists at the federal level (e.g., the EMA) each Minister has responsibility for risk, thus the onus is on federal departments to abide by requirements of legislation and prepare EM plans in response to those risks.
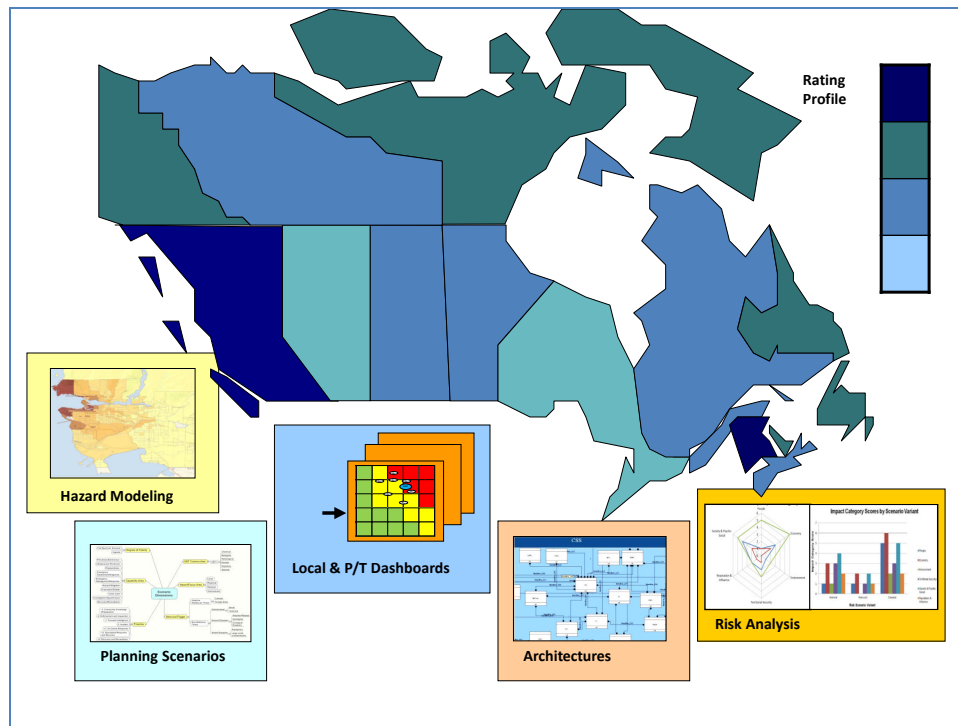
Figure 25: Preliminary Concept for National Risk Assessment Model

In this concept, the NRA leverages an inter-disciplinary team approach, in which P/T and local risk assessments conducted across multiple jurisdictions in a distributed fashion, can be aggregated into a federated model so that planners can exploit risk assessment data/info and develop coordinated responses, whenever they need it at any time. These assessments can be linked dynamically to geographical information systems (GIS) driven impact and consequences, capability maps, and a repository of past incidents and historical events. This conceptual model moves away from the fragmented approach that characterizes emergency management of creating and testing plans solely upon the trap of single hazard or one-dimensional view of societal vulnerabilities.

The NRA model seeks to adopt a network-based philosophy and exploit available IT and data analytics to overcome the challenges faced with traditional 'stove-piped' methods (i.e., through customized user interface, agile systems, adaptable to planners at all levels, tailorable to decision makers, assessments in real-time timely, drill-down capabilities, etc.). The all-hazards, overlapping, interdependent, national in scope, cross border, high consequence threat/risk/hazard environment, etc. highlights the requirement for a national risk assessment model that is integrated, horizontal, multidisciplinary, flexible, adaptive, and can contribute to multi-dimensional capability assessment and EM plans within a horizontal, joint, comprehensive and whole-of-government framework.

9.5.3 Methodology

A strategy to exploit the AHRA methodology that would be applicable to the federal and/or a national risk assessment approaches should consider the following levers:

- Merge AHRA with capability assessment;

- Design, develop and implement a hybrid regional approach support by GC; and

- Stakeholder analysis process (that would enable an impact analysis and capability assessment methodology).

Convergence with capability assessment, supported by data management and strategic asset management should be a reasonable way to not only exploit AHRA, but also to leverage the body of knowledge that resides in the federal IRAWG and CSS communities. The two figures below (Figure 26 and Figure 27) illustrate how AHRA can merge with capability assessment.
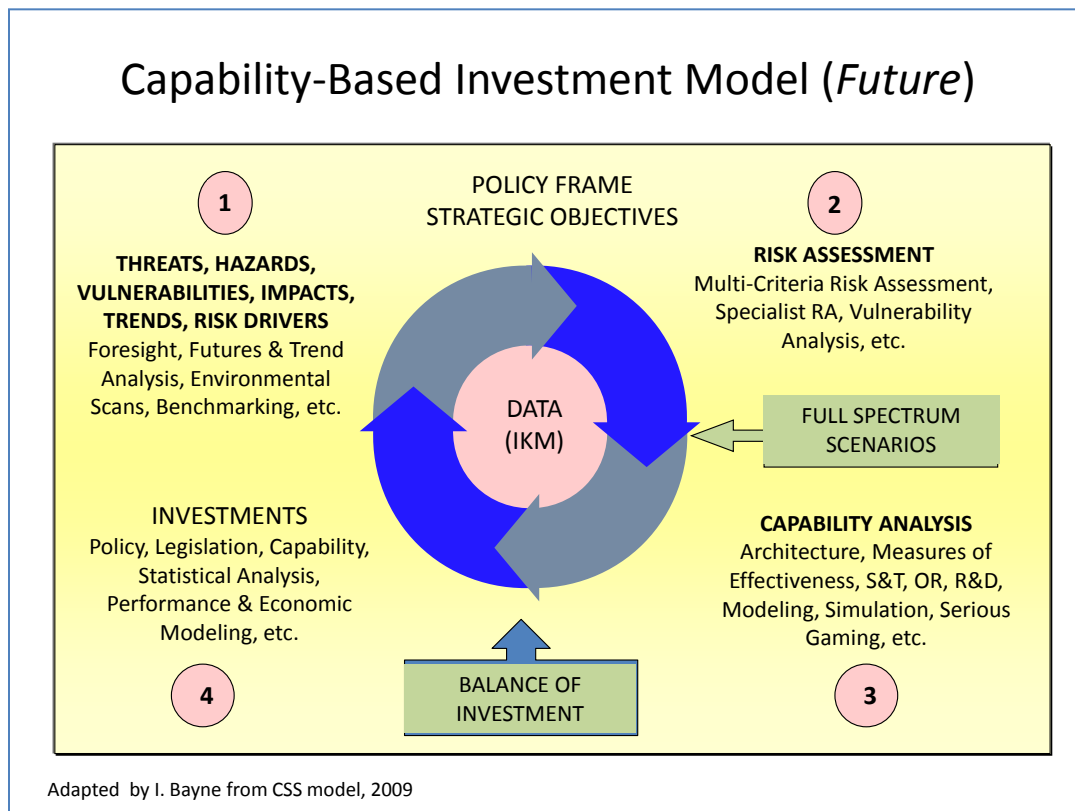

Figure 26: Simplified Capability-Based Investment Model (Future)

Figure 27 expands the process flow model that was developed during the AHRA pilot project. It has been updated to take into account ideas on convergence with capability assessment, as a major input to investment decision-making.
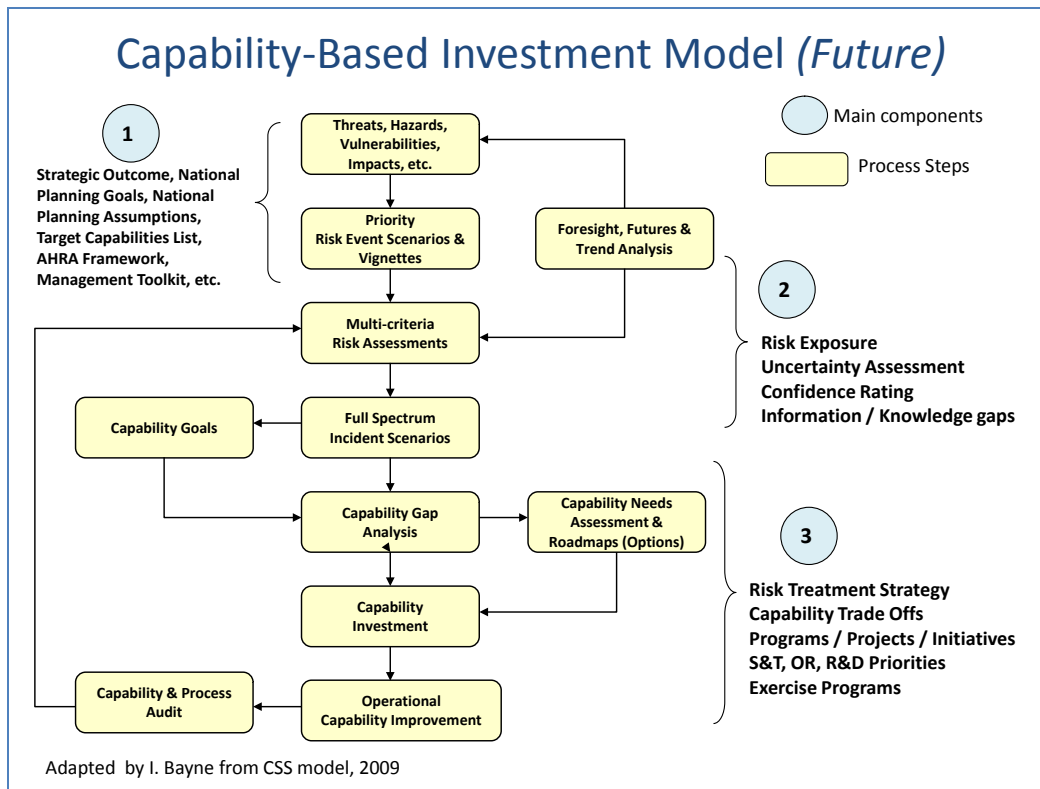
Figure 27: Capability Based Investment Model

9.5.3.1 Stakeholder Analysis

Existing EM documentation uses the term Federal, Provincial and Territorial (F/P/T or FPT) with the involvement of industry and other groups being implicit. However, the acronym does not include FNI in federal governance constructs. Just as the AHRA methodology identified stakeholders and willing participants, the NRA should do this for the regional concept. It makes sense to include FNI. It is also logical to include US regions. A NRA community mapping activity as part of a pilot project phase could establish a baseline and model for other regions.

9.5.4 Techniques

This section presents ideas to adjust AHRA techniques to support of capability assessment, AHRA as a stand-alone process, federal AHRA and/or NRA.

9.5.4.1 Risk Equation

The original equation seen in Figure 28 has not changed since before 2009. A variation of the risk equation is presented below. Its purpose is to highlight: the value of stakeholder and impact analysis being an explicit part of the technique; differentiation between impact and consequences; and the option of using different techniques for malicious and non-malicious risk assessments.
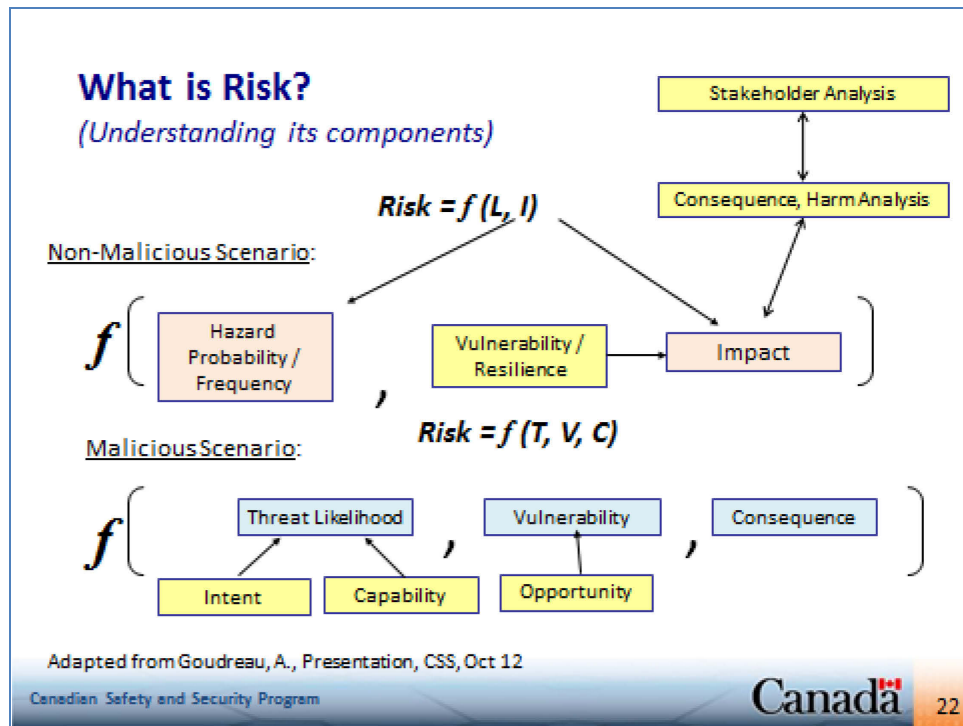
Figure 28: Alternative View of Risk Equation

9.5.4.2   Impact Analysis

The AHRA pilot project had envisaged more work on impact and consequence analysis, including development of impact and consequence taxonomies.   The AHRA Methodology Guidelines describe a six-level impact assessment framework. This model differs from the PS EMPG and the TB risk management models. Problems with some of these models is that they are too high level and federally-focused. Benchmark analysis of regional models should support development of a common model.

9.5.4.3   Treatment Strategy Selection

The current federal AHRA focuses on assessment and treatment actions with limited analysis on selection of an overall treatment strategy. It is recommended that the strategy selection part of the process receive more emphasis to avoid people rushing prematurely to the action planning stage. The following framework that also avoids the concept of risk ownership and highlights the collaborative strategy as an option is presented for consideration:

- **Accept**
    - Risk is acceptable and there is a process in place to monitor the risk over time,
    - Level of uncertainty is within the organization's tolerance levels,
    - Reasonable risk indicators, thresholds or other controls exist to provide early warning of changes (+/-),
    - Contingency plans exist and have been tested, and/or
    - Sufficient reserves exist and have been verified;

- **Avoid**
  - o Stop the activity until there is less uncertainty and the risk is acceptable);
- **Transfer**
  - o Insurance, and/or
  - o Formal agreement with a stakeholder(s) that minimizes liability to within reasonable limits or eliminates it altogether;
- **Mitigate/Treat**
  - o Removing the source of the risk,
  - o Changing the nature or magnitude of the likelihood,
  - o Changing the consequences,
  - o Reducing exposures or vulnerabilities,
  - o Conducting more research, investigation, or experimentation, and
- **Collaborate**
  - o Sharing the risk and/or responsibility for treatment planning with others;
- **Research**
  - o Environmental scanning and benchmarking,
  - o Cost, benefit and risk analysis of proven solutions,
  - o Experimenting or testing treatment strategies; and/or
- **Some combination of the above**.

9.5.4.4   Lexicon

The AHRA process involves the use of spreadsheets and database tools, which require dedicated administration resources. The AHRA Methodology Guidelines include a glossary. The NRA initiative should consider terms already being used by P/T. These can be captured during the development of risk profiles. The AHRA terms can be used as a reference model. The benchmarking activity should identify other useful resources, such as the DHS Risk Lexicon, the AS EM risk assessment methodology and the ISO 31000 resources are other examples. One of the challenges is that there are multiple risk domains. For NRA, it may be more productive to address terminology anomalies during the pilot projects an on a case by case basis. The language is stable enough to proceed without spending time on lexicons.

CSS has the original AHRA lexicon that compares terms used by federal organizations; however it has not been maintained. CSS also demonstrated that the use of architecture tools to identify and resolve lexicon anomalies (i.e., cyber-security architecture framework). The next step should be community mapping of regional approaches to terminology and taxonomies focusing on high risk scenarios for each region.

9.5.4.5   Taxonomy

The taxonomy effort should re-baseline the AHRA taxonomy including the addition of cyber-security, and development of impact and consequence taxonomies, which important for capability assessment. A quick review of the as-is taxonomy (see Figure 29) presented two lines of investigation – minor adjustments to include cyber-security; and longer-term investigation of options.
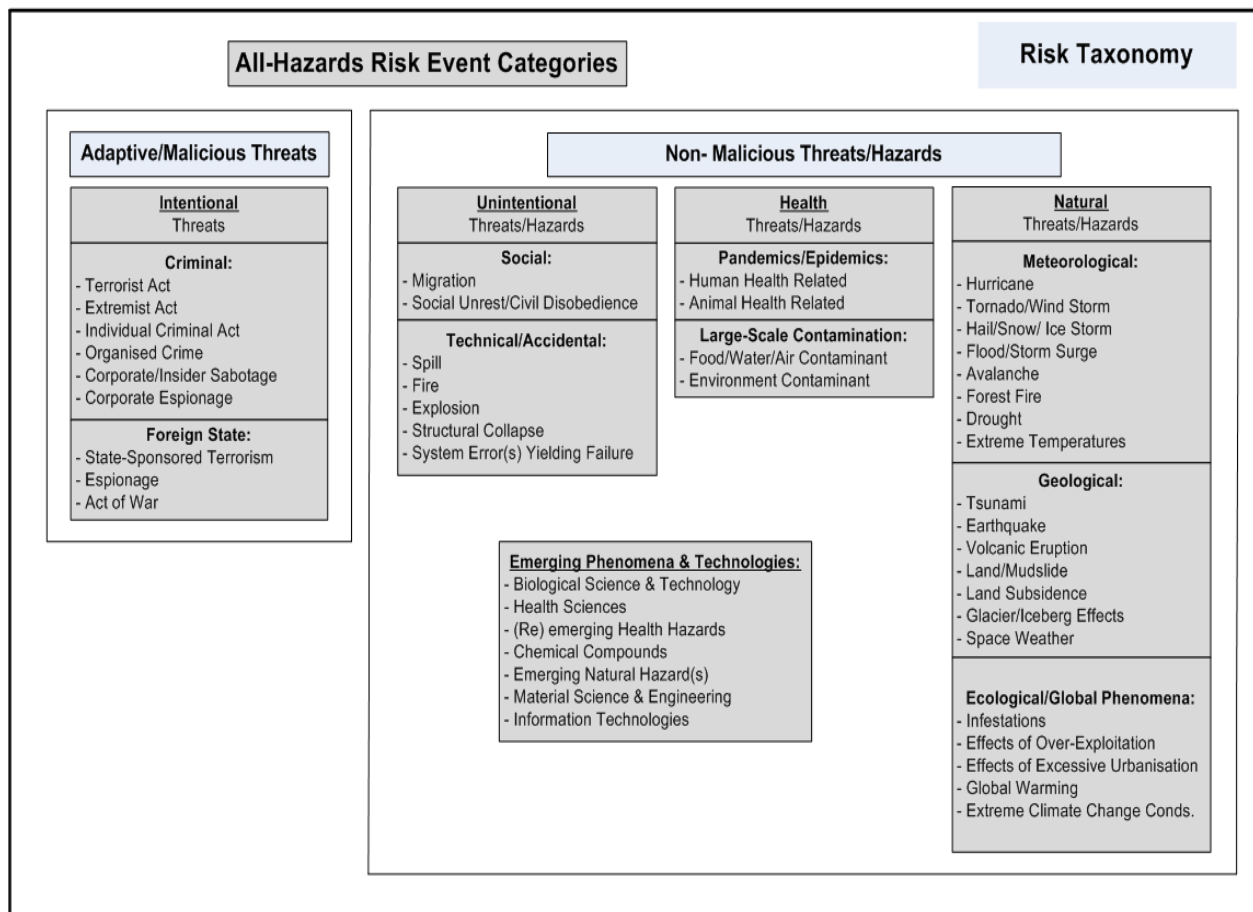
Figure 29: Current ('As-Is') AHRA Taxonomy

To address cyber-security as a matter of priority and national significance, the following categories could be considered: act of war; cyber-crime; cyber espionage; hacking; 'hacktivism'; cyber-attacks on vulnerable populations; and mass disinformation. There are undoubtedly other variations, but these seven categories should adequately define the landscape. An interesting element of the classification of cyber threats is that understanding whether the incidents are malicious or non-malicious is not as obvious as other adaptive threats (e.g., terrorist attacks that seek publicity; criminal acts that break the law).

Adjustments that should be considered as part of the rebase-lining activity include:

- **Categories**: Malicious and non-malicious are useful characteristics, but their use as categories skews the taxonomy towards threats not risks. It is not always obvious whether events are malicious or non-malicious, and labeling them malicious can trigger an inappropriate risk assessment process (and treatment strategy). A plain language approach to categorization may improve clarity even if it presents more categories such as: terrorism; natural disasters; human-caused disasters; infectious disease outbreak; environmental disasters; technological failures; infrastructure failures; transportation

accidents; loss of control of resources; insufficient S&T / R&D; failure of academia to meet future needs;

- **Terminology**: There is a mix of threat, hazards, impacts, effects and phenomena. While these labels may be useful taxonomies in their own right, trying to capture them on a single taxonomy can cause ambiguity, inconsistency and duplication. A family of taxonomies is a more practical approach that would support other work such as lexicon, architecture and capability assessment. Also, disruptive technologies are included as a risk, but it is more likely an area of uncertainty (or opportunity). The methodology should distinguish between risk and uncertainty;

- **Ambiguity**: Several terms are ambiguous, which reduces their usefulness as groupings including: large-scale; emerging (natural hazards); social migration (as a threat/hazard); effects of urbanization; and effects of over-exploitation;

- **Gaps**: If this were truly a risk taxonomy, instead of a threat and hazard taxonomy, then there are a number of risks that are difficult to see in this construct including several that are hard problems at the local and regional levels: mass casualty; mass evacuation; mass decontamination; air plane crash; oil rig explosion and/or fire; financial system failure; gangs; lack of EM capability including reserves; and disaster in a bordering state; and

- **Focus**: Canada has not defined what constitutes an incident of 'national significance.' This ambiguity is reflected in the taxonomy, which includes several localized risk events that would probably not fit such a definition.

Taxonomies should be considered for: safety, security and resilience capabilities; impacts and consequences, and acts of terrorism that include actors, vectors and precursors amongst other groupings. A dynamic process and tools are needed to keep the taxonomy alive and useful as an assessment aid and as a checklist. For example, each workshop is an opportunity to improve the taxonomy, and identify opportunities for other taxonomies that improve understanding, and address epistemology challenges.

9.5.4.6   Risk Assessment Techniques

The AHRA involved a community mapping process to capture a horizontal view of risk assessment techniques. This information was consolidated in a compendium (Excel Spreadsheet). However, the information has not been maintained. Although the various techniques were mandate- and domain-specific, it is generally recognized that there is value in departments understanding other organizational approaches. Furthermore, there are many risk assessment techniques that departments are already using that are not captured in the compendium/community mapping exercise because of the way the questions were presented.

While the process is adaptable to an NRA concept, the information management plan and how this information would be used must be clearly communicated to participants. The mapping process could open the door to other risk assessment techniques including those described in ISO 31010 (Volume II, Folio 8 includes a list of 31 techniques). Using other decision support tools might also be more appropriate at the regional level.

DRDC CSS continues to investigate visualization tools and techniques. EM practitioners do not always have time to read lengthy risk profiles; risk matrices including the ones coming out of the AHRA. This documentation tends to have a short life span. Moreover, management scorecards are more familiar to decision makers. There are examples of dynamic visualization tools on the Internet that might be relevant, and there are lessons from departmental work (e.g., NRCan HAZUS-Canada).

9.5.4.7 Multi-Criteria Risk Assessment

The term 'all hazards' is used to refer to the framework or methodology wherein multiple risk assessment techniques and tools can reside including: a balance of quantitative and qualitative techniques; and tools that enable better risk-informed decisions across organizational, mandate, jurisdictions, geographical borders and other boundaries. The term multi-criteria risk assessment (MCRA) is suggested to differentiate the framework from the technique. MCRA is a generally-accepted term for techniques that consider multiple variables, not just likelihood and impact. The approach is more appropriate for malicious threats and hazards where there is past experience, data and/or intelligence. However, in cases where there is more uncertainty the impact can be a more dominant factor – how bad could it be and how prepared are we to deal with risks and consequences over time?

There are already some variations in the appreciation of AHRA in that some analysts use frequency instead of likelihood. It is important to remember that the AHRA was never intended as a 'one-size-fits-all' approach. It was intended to provide a concept and framework for comparing risk assessments from diverse risk domains to support decisions on risk treatment investments.

9.5.4.8 Scenario-based Workshops

A workshop management plan and tools need to be developed that can be reused and adapted by regions. This would include: analysis of who participates and when; preparation activities including plans for pilot projects and analyses of existing regional practices; expected outcomes and outputs; and facilitation and documentation approaches. EM practitioners are used to participating in workshops. However, it should not be assumed that EM practitioners have the skills and tools to optimize the workshop experience. There should be a good body of knowledge from the AHRA participants to identify opportunities for improvement including the use of trained facilitators. One approach for NRA would be to conduct three levels of workshops with appropriate levels of AF, OR and S&T support: practitioner / SME; business, asset and operational managers; and senior decision makers. There should be a formal lessons learned process an development of case studies (2-pagers) for the existing federal workshops.

9.5.5 Supporting Systems

This section presents supporting system levers for a NRA concept.

9.5.5.1 Empowering Decision-Makers

Decisions concerning risk or uncertainty are made continuously throughout society often under time and other pressures. These decisions inherently take into consideration all information that

is available at the time. The volume of information that is accessible via the Internet or social media means that not all information is necessarily accurate or trustworthy. This reality places decision makers at greater risk. However, the more informed the decision; the greater the likelihood of a favourable outcome.

The AHRA framework is intended to inform risk specialists, strategists, planners, policy makers and senior decision makers. The effect of keeping the AHRA experience within the community is that decision makers might not have confidence in the process, they could ignore the outputs and/or they could withdraw support for further development.

Therefore, a communications strategy is needed on two fronts – AHRA and NRA. The strategy needs to address providing the right information to the right audience at the right time. Communicating risk is complicated. There are likely case studies in the health, crime prevention and other domains that should be exploited. Displaying the risk priorities relative to the other risks being assessed at a single point in time is a small part of the problem. The real challenge is empowering decision makers to be able to assess the value of the risk information within their context. A network of risk domain, communications and IT, learning, multi-media, social media, analytics, performance measurement and other specialists should be accessible to a NRA team to help design the collaboration tools from the beginning.

9.5.5.2   Agile Project Management Support Frameworks

Assuming that the NRA is managed as an agile program with minimal administration overhead, the implementation strategy and transition plan identify requirements for: governance; performance measurement (for the overall activity, and the discrete activities including the methodology, techniques and workshops); S&T, OR and architecture priorities that support the NRA and continue to support CSSP, should GC decide not to implement NRA; and that assess a way forward to maintain access to Futures, Foresight and Trend Analysis; IKM and collaboration; and user guides and tools for participants. These frameworks should be one-page frameworks not lengthy how-to guides.

9.5.5.3   Technology Roadmaps

A NRA technology road map should be developed to exploit reasonably mature OR, architecture, collaboration, information protection, security and privacy assurance, web-based, social media, open source and crowdsourcing technologies. This would be applicable to PS (and CSSP) future work.   The strategic outcome would include leveraging and expanding the knowledge of stakeholders across Canada.

9.5.5.4   Cost, Benefit and Risk Analysis

PS/CSS should develop a cost, benefit and risk analysis model that can be used for multiple purposes including the NRA option analysis and the methodology itself (e.g., balance of investments).   Other outputs of the model should be decision criteria, cost drivers, and performance and risk indicators that are adaptable for different jurisdictions, regions and risk domains. A baseline cost, benefit and risk analysis should consider the as-is situation – no NRA (and reliance on ad hoc processed); and an effective, credible and sustainable NRA activity.

9.6   Recommendations

The recommended way forward is a regional strategy with the primary outputs being regional risk profiles and a gap analysis of (industry) sector risk profiles for two or three high priority sectors. Other outputs of a pilot project would likely include: identification and resolution of anomalies in terminology; a set of taxonomies that are useful at the regional level; a set of scenarios that is tailorable for regional purposes; lessons from regions on methods, best practices and risk assessment techniques; a plan for sharing information across jurisdictions and risk domains, and between public and private sector stakeholders; and insight into processes that work best for high priority risk scenarios in all regions.

The main thrusts to improve exploitation of the AHRA information baseline and to expand the knowledge base include:

- Engage the IRAWG community in the advancement of the methodology and techniques, including getting feedback on the BoK and improving the implementation, transition and exploitation concepts;

- Engage the federal community in re-baselining AHRA;

- Engage the federal community in the option analysis, and development of the policies and/or strategies to implement a sustainable NRA concept;

- Engage P/T authorities to assess the as-is situation in terms of methodologies and techniques from a regional perspective;

- In collaboration with P/T authorities, collaboratively design, develop and implement one or two pilot projects based on the scenarios that are the highest regional priorities, and use this information to adjust the NRA strategy;

- Document success stories in specific risk domains (e.g., health and medical; crime prevention, natural resources);

- Develop brief descriptions of discrete parts of the AHRA and NRA (how-to's; aide memoires);

- Develop logic models and/or NRA frameworks from a regional perspective to support implementation of a multi-year program; and

- Develop a cost, benefit and risk analysis of the as-is and to-be situations.

Figure 30 illustrates the elements of an NRA program using a four-level management paradigm that includes overlapping jurisdictions and mandates. It illustrates that the federal contribution should include: lessons learned from AHRA; scenario and workshop approaches; information sharing and collaboration techniques; and in the case of adaptive malicious threats, threat evaluations. The figure depicts the 'as-is' Canadian fragmented picture of risk exposure, capabilities and balance of investments.

4-level risk management / resilience model

Layer	Description
Strategic *International*	• Multi- or bi-national agreements; strategic policy; planning... • International standards and best practices (all sectors); Country Risk Profiles • International organizations' risk estimates and profiles (e.g., WEF, OECD, UN, WTO, World Bank...) • Foreign Governments – national risk assessments (programs) • Major events – Prevention/Mitigation; Preparedness; lessons learned... • Protected areas, assets; vulnerable populations, ecosystems, ecologies, resources and species...
Government *Program / Service* GC	• Risk assessments related to GC policy, program delivery and service to Canadians, and inter-jurisdictional activities (F/P/T/First Nations...) • GC integrated risk management as part of decision making and accountability frameworks (MAF) – Corporate Risk Profiles; environmental scans; strategic planning processes; enterprise risk assessments... • All Hazards EM planning and AHRA Framework – Federal perspective – significant risks by mandate and consolidated views; economic forecasts and risk assessments; health, energy, resource and environmental risk assessments... • Some specialist risk assessments (e.g., financial risk management; internal audit; species at risk; ecosystems...)...
Operational *S&T and industrial preparedness* P/T/FNI / Industry / P3 / NFP / Public	**GC** • Primary Departments – mandate-specific operations and services; domain-specific risk assessments... • Supporting Departments – operations support of GC priorities and Primary Departments including Security & Intelligence agencies; Specialist Advice ; S&T/OR; R&D; futures / foresight; labs / testbeds... **Other Jurisdictions (P/T/FNI...)** • Jurisdictional or Regional Risk Profiles including cross-border risk assessments / risk-based approaches • Critical infrastructure / "system" asset owners (Industry Sector , Community and Corporate Risk Profiles; education; natural resources; vulnerable populations; monuments & icons / heritage /culture...) **Other Stakeholders (industry, NFP, associations, public, investors...)** • Not-for-Profit; professional associations; community organizations; vulnerable populations...
Support *Management /* *Administration /* *Education / Research*	• Risk assessment techniques and tools; professional development;... • Education, training and awareness (management toolkits) • Data, information and knowledge management; collaboration and learning environments; crowdsourcing; social networks • Others – Insurance Industry; Academia; Statistics; Think Tanks (e.g., Conference Board of Canada; RAND...)

Figure 30: NRA Strategic Management Framework

9.7 Conclusions

The ongoing AHRA work continues to demonstrate the value of systematic, team-based and multi-disciplinary approaches to scenario-based risk (and/or risk-based capability) assessments that support safety, security and resilience planning, capability assessment and investment decision making.

GC IT infrastructure improvements are envisaged that should improve information sharing including sharing sensitive information within the GC and with other jurisdictions in the near future. In the interim, manual workarounds and simple processes are needed to enable collaboration.

To advance and extend the AHRA to a strategic NRA activity, five key ingredients are envisaged:

- Political will, flexible participative governance and engaged executives;
- Shared funding models and multi-year commitment of resources;

- Practical solutions for data, information and knowledge management;

- Management toolkits to support specialists and decision-makers on multiple levels; and

- Continued advancement of S&T, OR and R&D capabilities to support safety, security and resilience strategic outcomes.

Aspects of knowledge management that are relevant to future work include: enablers for sharing unstructured data and sharing information including classified and sensitive information; and systematic approaches to performance measurement, lessons learned and benchmarking to stimulate learning and knowledge creation. The BoK project demonstrated two representative off-the-shelf tools that could support future work (*CiriLab Organizer, MindJet*). Several federal departments are experimenting with enterprise tools for architecture and business analytics[65]. There is no common approach within the federal government, which poses a potential limitation on collaboration within GC and with other jurisdictions. Future community mapping activities and the pilot projects should identify regional capabilities in this area.

The CDAI Strategic Outlook states that Canada is already going through a "re-evaluation of the dangers that truly menace Western States and the benefits that accrue from investments made in waging the "war on terrorism" and in attempting "nation-building" in war-torn societies."[66] Therefore, given the global security environment, the impact of natural disasters on Canada or its trading partners, and the current fiscal situation and emphasis on debt reduction, the capability to apply risk-based approaches to safety, security and resilience decision making should increase in importance. The challenge is to transition quickly from a federal perspective and methodology to a concept that is relevant for all regions of Canada. [Note: the potential application of AHRA in the national defence remit is a separate discussion, which goes beyond the scope of the federal AHRA concept-based approach. It is envisaged that a NRA can proceed based largely on open source intelligence, where applicable].

The application of AHRA lessons, in combination with existing federal, regional, S&T. academia and international partners' knowledge should enable a streamlined NRA approach that achieves a better balance of investments to improve preparedness and mitigate societal risks. This exploitation concept includes suggestions to transition towards a national framework that overcomes challenges and systemic constraints. One suggestion is that AHRA should merge with the capability assessment methodology and critical infrastructure activities to help specialists, operational managers and executives focus on high priority risks from regional, national, continental and potentially, global perspectives.

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[65] Examples include *Autonomy*, *Endeca* and *Qualiware*.
[66] *The Strategic Outlook 2013*, p. 47.

10   Conclusion

This report has documented and described the federal AHRA, the underlying conceptual approach, and considerations for developing and implementing a NRA concept. The goals of such a NRA are to capture and aggregate a collective view of risk across the country and to enable the prioritization of risk treatment priorities through the application of consistent risk (and capability) assessment and management techniques. This risk-based prioritization process, in combination with P/T and local techniques (e.g., taxonomies and dashboards), supported by dynamic risk modeling, scenario planning, architecture frameworks and expert judgement can highlight strategic treatment and capability investments in a changing and unpredictable public safety, security and resilience environment.

This report has also examined the process of building the AHRA model, from its conceptual origins through to implementation and ongoing maturation that integrates multi-dimensional views of risks and capabilities into a comprehensive decision support framework. This integrated view of risk exposure and potential consequences improves coordination and provides better situational awareness among federal departments of the relationship between malicious and non-malicious threats and hazards facing the federal government and society. After examining the AHRA concept, the issues and challenges associated with governance of the federal 'as-is' AHRA and the 'to-be' NRA model were explored. Transitioning the federal AHRA to a national concept will require strategic leadership and collaborative planning. A clearly defined governance strategy is needed for a program that could lead to changes to policy and legislation. Ultimately, a governance model that promotes a shared leadership construct between the all levels of government and other stakeholders will serve as the basis for a NRA concept.

In addition to establishing the requirement for a more flexible governance structure, this report focused on the three foundational building blocks that were used to clarify the nature of all hazards risks across federal departments and agencies. Specifically, a common lexicon and taxonomy were used to eliminate inconsistencies in the vocabulary, establish a common terminology and facilitate communications. The taxonomy also served as a schema to identify inter-relationships of risks across a range of categories (e.g., hazards, threats, vulnerabilities, impacts, consequences, domains, etc.).   This framework contributed to building a shared understanding of what constituted the risk problem space, and by extension the EM policy, planning and federal decision making environment. The community mapping technique was used to capture stakeholder information, and compare risk assessment methods and approaches across institutions and mandates. These three inter-related building blocks provided a mechanism to capture inputs of stakeholders representing many federal organizations with national security, public safety and emergency management responsibilities. These approaches can also be updated to provide a model for advancing a NRA initiative in collaboration with P/T authorities. The AHRA 'spiral development' approach and techniques could support the formative stages of the NRA. These approaches would also help to identify national and regional planning objectives and assumptions, scenarios, and scalable criteria and metrics that would improve the understanding of regional vulnerabilities and investment priorities.

The exploitation concept and application of systems architecture frameworks can also be used to build national and regional models for organizing and characterizing safety, security and

resilience systems of systems (e.g., organization, mandates, legislation, responsibilities, critical infrastructure vulnerabilities, major industrial centres and transportation hubs, etc.), which would support emergency management decision-making processes. Architectures, in combination with capability assessment, provide a structured approach to identify capability gaps and to exploit pockets of information that reside in stakeholder organizations. These techniques also enable 'sensitivity analysis' of emergency management and resilience capabilities across a temporal continuum to determine which investments add the most value (e.g., resources; reserves; pre-positioning; process improvement; information; equipment; training). The implementation and transition plans describe a number of work packages and activities that would apply lessons from the federal AHRA experience to a NRA capability, including: data, information and knowledge management; environmental scanning; architecture; OR; futures, foresight and trend analysis; and benchmarking,

This report presents an exploitation concept for extending and expanding on the federal AHRA to a strategic NRA activity. In this section, five key ingredients were highlighted as necessary conditions for facilitating the adoption of a NRA in Canada, including: political will; flexible, participative governance and engaged executives; shared funding models and multi-year commitment of resources; practical solutions for data, information and knowledge management; management toolkits to support specialists and decision-makers on multiple levels; and continued advancement of S&T, OR, and academia and industry R&D capabilities. The application of AHRA lessons, in combination with existing federal, regional, S&T, academia and international partners' knowledge, should enable a streamlined NRA approach that improves balance of investment decisions across organizational and other boundaries to improve preparedness for incidents of national significance, enhance resilience and mitigate societal risks.

The recommended way forward is a decentralized regional strategy with federal support that produces regional risk profiles and completes gap analyses of critical infrastructure sectors focused on high priorities for specific regions. Some of the main recommendations to improve exploitation of the AHRA as a federal and/or a national methodology and technique include:

- Develop a strategy and get management buy-in from federal and P/T/FNI authorities;

- In collaboration with P/T/FNI authorities, collaboratively design, develop and implement one or more pilot projects based on regional priorities:

    o Use this information to assess the as-is situation in terms of methodologies and techniques from a regional perspective, and

    o Develop a practical and streamlined NRA strategy (e.g., regional lead with federal support);

- Update the AHRA methodology and techniques including a refined set of taxonomies that address known gaps, and that include new taxonomies (e.g., impacts and consequences);

- Review/refine the description of impact categories and develop a standardized national framework;

- Engage the federal community in the NRA option analysis including: the development of the strategy to implement a sustainable NRA concept-based approach; workshop practices; techniques to compare regional and sector risk profiles; lessons from federal scenario development and performance measurement);

- Document federal, regional and transnational collaboration success stories for specific risk domains or CI sectors (e.g., transnational organized crime, counter-terrorism, border management, health and medical countermeasures; crime prevention, integrity of natural resources; critical infrastructure protection; environment and ecosystem protection);

- Develop a communication strategy including tailored briefs for diverse audiences of discrete parts of the AHRA and NRA (e.g., business case; fact sheets, techniques);

- Develop logic models and/or NRA frameworks that incorporate a regional perspective to support implementation of a multi-year program; and

- Develop a cost, benefit and risk analysis of the 'as-is' and 'to-be' risk assessment situations.

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This list contains documents that formed the basis for the analysis contained within this report, and the way forward. It is not a complete inventory, and it does not include classified documents. When the source is not Canadian, the file name includes the source nation or organization, so that references are grouped by nation and/or source (e.g., US or DHS). The products on this list were selected based on best judgement. The intent is to provide enough information for readers to find those documents on the web or from the source. This selective list is intended to be forward-focused and relevant to building a national picture of risk exposure to support strategic decision making. When presentations are cited, best effort was made to identify the most current and useful document. Canadian federal EM references to risk assessment are captured in Volume II. There are opportunities to share information with trusted organizations and to learn from other sources including nations that are exposed to health hazards, terrorist acts, large-scale industrial accidents and national catastrophes that most Canadians have not (yet) experienced.

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List of symbols/abbreviations/acronyms/initialisms

ADM EMC	Assistant Deputy Ministers' Emergency Management Committee
AER	After-Event Review
AAR	After-Action Report
AHRA	All Hazards Risk Assessment
AS	Australia
BoK	Body of Knowledge
BOI	Balance of Investment
CoP	Community of Practice
CBIM	Capability-Based Investment Model
CBSA	Canada Border Services Agency
CFIA	Canadian Food Inspection Agency
CIP	Critical Infrastructure Protection
CIPAR	Critical Incident Preparedness and Response
CNSC	Canadian Nuclear Safety Commission
CSS	Centre for Security Science
CSSP	Canadian Safety & Security Program (CSS)
DHS	US Department of Homeland Security
DM EMC	Deputy Ministers' Emergency Management Committee
DND	Department of National Defence
DNDAF	Department of National Defence Architecture Framework
DND CDI	DND Chief of Defence Intelligence
DODAF	US Department of Defence Architecture Framework
DRDC	Defence Research & Development Canada
DRDKIM	Director Research and Development Knowledge and Information Management
EC	Environment Canada
EM	Emergency Management
EMA	Emergency Management Act
EMF	Emergency Management Framework
EMPG	Emergency Management Planning Guide

EMSI	Emergency Management and System Integration
ESF	Emergency Support Function
FERP	Federal Emergency Response Plan
FNI	First Nations and Inuit
F/P/T	Federal/Provincial/Territorial
GC	Government of Canada
GC CTEC	Government of Canada Cyber Threat Evaluation Centre
GIS	Geographic Information System
HC	Health Canada
IACG	Intelligence Assessment Coordination Committee
IRAWG	Interdepartmental Risk Assessment Working Group
ISO	International Organization for Standardization
ITAC	Integrated Terrorist Assessment Centre
IWG	Interdepartmental Working Group (AHRA Pilot Project)
KM	Knowledge Management
MOE	Measures of Effectiveness
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
NL	Netherlands
NRA	National Risk Assessment (UK, NL, CA)
NRCan	Natural Resources Canada
NZ	New Zealand
OGD	Other Government Departments (and agencies)
OR	Operations Research
PCO	Privy Council Office
PESTLE	Political, Economic, Social, Technological/Technical, Legal, Environmental (EMPG)
PIP	Project Implementation Plan
P/MPRR	Prevention/Mitigation, Protection, Response and Recovery (EMF)
PS	Public Safety Canada
P/T/FNI	Provincial/Territorial/First Nations Inuit
R&D	Research & Development

RA	Risk assessment
RACI	Risk Assessment and Capability Integration (CSS Section)
RACI	Responsible, Accountable, Communications, Information
RCMP	Royal Canadian Mounted Police
RRAP	Regional Resilience Assessment Program (PS)
S&T	Science & Technology
SEMP	Strategic Emergency Management Plan
SME	Subject Matter Expert
SNRA	Strategic National Risk Assessment – US DHS
SOREM	Senior Officials for EM
SRA	Society for Risk Analysis
SWOT	Strengths, Weaknesses, Opportunities, Threats
TBS	Treasury Board Secretariat
TC	Transport Canada
TCL-C	Target Capabilities List - Canada
TOC	Transnational Organized Crime
TR	Technical Report
VRAC	Virtual Risk Analysis Cell (PS)
WBS	Work Breakdown Structure
WGE	Working Groups of Experts

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Public Safety (PS) Canada and Defence Research & Development Canada's (DRDC) Centre for Security Science (CSS) are in the process of investigating improvements to the federal All Hazards Risk Assessment (AHRA) methodology that would enable the federal government to develop a national picture of high priority risks and capabilities that mitigate those risks.

The primary objective of this report is to establish an information baseline that can support exploitation of the AHRA work to date. A secondary objective is to identify challenges and opportunities to improve the AHRA methodology and techniques, and to support decisions related to continued federal work and/or the transition to a NRA concept. This Technical Report (TR) is intended for participants in the federal AHRA initiative, and for a wider audience involved in safety, security, societal resilience and emergency risk management. The report highlights lessons from the federal AHRA approach that would support multi-mandate and multi-jurisdictional risk assessments, and enable the development of a national risk assessment (NRA).

A possible concept of operations is that regional authorities, supported by federal specialists (and preferably funding) implement a series of workshops focused on regional high risk scenarios. The outputs of these workshops would include regional risk profiles that would be merged into a national picture of risk exposure, regional best practices including in the area of critical infrastructure and international collaboration, and strategic opportunities to improve investment decision making. Also, the AHRA should merge with a capability assessment methodology, and the federal government and regional stakeholders should produce the documentation, and develop the mechanisms and support systems to promote and sustain collaboration

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Sécurité publique Canada (SP) et le Centre des sciences de la sécurité de Recherche et développement pour la défense Canada (RDDC CSS) examinent actuellement les améliorations pouvant être apportées à la méthodologie d'évaluation tous risques (ETR) du gouvernement du Canada afin que ce dernier brosse un portait des principaux risques et des capacités atténuant ceux-ci à l'échelle nationale.

Le présent rapport vise avant tout à établir une base de données soutenant l'exploitation des travaux d'ETR à ce jour. Il a également comme objectif de cerner les problèmes et les possibilités liés à l'amélioration des techniques et de la méthodologie d'ETR, ainsi qu'à l'appui à la prise de décisions concernant les opérations fédérales continues ou la transition vers un concept d'évaluation nationale des risques (ENR). Ce rapport technique (RT) est destiné aux gens participant à l'initiative fédérale d'ETR, de même qu'à un plus large public associé à la sûreté, la sécurité, la résilience sociétale et la gestion des risques en situation d'urgence. Le rapport souligne les leçons tirées de l'approche fédérale d'ETR pouvant soutenir des évaluations de risque touchant plusieurs mandats et compétences, et permettant l'élaboration d'une ENR.

Un concept possible des opérations est que des autorités régionales, soutenues par des

spécialistes fédéraux (et préférablement financées par le gouvernement fédéral), mettent en œuvre une série d'ateliers axés sur des scénarios régionaux de risque élevé. Les résultats de ces ateliers comprendraient des profils régionaux de risque qui, une fois réunit, brosseraient un portrait de l'exposition aux risques à l'échelle nationale, des meilleures pratiques régionales (y compris dans le domaine de l'infrastructure essentielle et de la collaboration internationale) et des possibilités stratégiques d'amélioration du processus décisionnel relatif aux investissements. En outre, l'ETR devrait être combinée à une méthodologie d'évaluation des capacités. Le gouvernement fédéral et les intervenants régionaux devraient produire la documentation et élaborer les mécanismes et les systèmes de soutien visant à promouvoir et à maintenir la collaboration.

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All Hazards; Risk Assessment; Risk Management; Planning; Emergency Management