



Intelligence Experts Group All-Hazards Risk Assessment Lexicon

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Abstract

This document proposes a *lexicon* of key risk terms, to establish a common terminology among partners collaborating on the All-Hazards Risk Assessment project. The definitions included in this lexicon have been compiled by consulting a variety of sources and through iterations with various risk communities. The goal is to have consistent and flexible terms that accommodate as much as possible the specialized terminology in specific risk domains. The hope is that the final document will have wide acceptance, providing a sound basis for the dialog among the project partners, and thus improving the effectiveness of the collaborative effort.

Résumé

Le présent document propose un *lexique de l'évaluation des risques*, afin d'établir une terminologie commune à tous les partenaires qui collaborent au Projet d'évaluation tous risques. Les termes et les définitions qui figurent dans ce lexique proviennent de multiples sources, et notamment de consultations avec divers spécialistes de la gestion des risques. L'objectif est d'avoir une liste de termes uniformes et faciles d'emploi qui couvre le plus grand nombre possible de secteurs de risque spécifiques. Notre espoir est que le document final sera bien accueilli et s'avérera utile pour le dialogue entre les différents partenaires associés au projet, améliorant du même coup l'efficacité de l'effort de collaboration.



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Introduction

1.1 Background

In 2006, the Intelligence Assessment Coordination Committee (IACC), an inter-departmental coordinating body for the Canadian intelligence assessment community chaired by the head of the International Assessment Staff (IAS) Secretariat of the Privy Council Office (PCO), set up an Intelligence Experts Group (IEG) on Domestic Security, to facilitate the sharing of intelligence on domestic threats and to produce assessments. The group includes participants from 18 federal departments and agencies under the interim leadership of the Department of National Defence (DND) and the Royal Canadian Mounted Police (RCMP). One assessment requested by the IACC was an All-Hazards Risk Assessment (AHRA) that could potentially inform senior federal government decision-makers in the areas of funding, learning and development, resource allocation and threat assessment.

The Defence Research and Development Canada (DRDC)'s Centre for Security Science (CSS) has been set up as a joint endeavour between the Departments of National Defence and Public Safety, extending S&T services, which DRDC traditionally provides in support of the Canadian Forces, to address national public safety and security objectives. Within CSS, a Risk Portfolio has been established in response to growing interest in the risk field from across government and defence. The vision is to develop a risk resource centre to support the community with threat, vulnerability and risk assessments, gap analysis, foresight and future security visioning and other related activities and products. Given its mandate and the project's importance, CSS supported the AHRA initiative, as one that has the potential of benefiting the entire safety and security community, including various levels of government.

1.2 Understanding risk

Risk is an intellectual construct, contingent on the belief that human intervention can influence the outcome of future events, as long as an effort is made to anticipate these events. Oftentimes risk has a negative connotation and is associated with the possibility of future harm or loss.

In simple terms, risk is the product of probability and impact, where "probability" refers to a risk event's likelihood of occurrence and "impact" measures the severity and extent of the event's consequences. Indeed, any risk assessment methodology is likely to start with a "risk equation" along these lines. But while this formula is sufficiently general to grant acceptance with a broad audience of "risk professionals", it must be refined further in order to be of practical value to anyone tasked with a specific assessment. When the "future" is charted out in "slices" that speak to one's personal, organizational or public interests, decision-making processes need to be informed by tailored assessments, requiring more precise definitions for risk.

The major difficulty facing an “all-hazards” methodology is defining and finding good measures for “probability” and “impact” consistently across risks of very different nature. Each of these terms has a number of influences, the importance of which is recognized on many different levels. Herein lies a challenge for the AHRA project: finding a definition of risk that is precise enough to be useful at “working level”, while general enough to accommodate sometimes fairly disjoint risk categories. To address this challenge, one of the first developments initiated in support of the project was a *lexicon* of key risk terms.

The purpose of this document is to ensure a common terminology among partners collaborating on the All-Hazards Risk Assessment project. When formulating the definitions, we have consulted a variety of sources in order to have definitions that accommodate as much as possible the specialized meaning of terms used in specific domains. We strived for consistency and flexibility, including alternate definitions when warranted. We hope that with insights from, and through iteration with, various risk communities within and beyond the core IEG members, the final document will have wide acceptance, providing a sound basis for the dialog among the project partners, and thus improving the effectiveness of the collaborative effort.

Definitions

Accident

An event or occurrence which is unintended, unforeseen and unexpected. An accident may be seen as resulting from a failure of hazard controls.

Act of God

An event happening independently of human volition and generally interpreted as being beyond human control, which human foresight and care could not reasonably anticipate or at least could not prevent or avoid (earthquake, flood, tornado, and other natural events).

Action

An activity which the decision-maker may decide to implement with the intention of mitigating a risk.

Activity

1. A complex set (or web) of tasks performed as part of a specific process.
2. In public administration, a task or combination of tasks assigned to a governmental unit.

Application Domain

The problem area of an expert system, or of a bounded set of related systems (i.e., systems that address a particular type of problem). A domain corresponds to a specific field of knowledge or expertise.

Condition

The key circumstances, situations, etc., that are causing/may cause harm, instability, anxiety, or uncertainty.

Consequences

The possible negative outcomes of the conditions that are creating uncertainty and/or risk.

Consistency

The degree of uniformity, standardization, and freedom from contradiction among the components of a system, or parts of a document.

Context

Provides additional detail regarding the events, circumstances, and interrelationships that may affect the risk. This description is more detailed than can be captured in the basic statement of risk.

Contingency Plan

The process of identifying and planning appropriate actions to be taken when, and if, a risk actually occurs.



Critical Infrastructure (CI)

The framework of interdependent networks and systems comprising identifiable industries, institutions, including people and procedures, and distribution capabilities which if destroyed, degraded or rendered unavailable for an extended period would significantly impact on the reliable flow of products and services essential to the defence and economic security of a nation, the smooth functioning of governments at all levels, and society as a whole.

Critical Infrastructure Interdependencies

The complex linkages or relationships between two or more infrastructures that depend on each other, such that failures within linked infrastructures may result in cascading effects that are neither readily apparent nor immediately understood. Such linkages vary in scale and complexity and can be described in four general categories:

- i. Physical: where the material output of one infrastructure is used by another (physical reliance on material flow from one infrastructure to another direct linkage between infrastructures as from a supply/consumption/production relationship);
- ii. Cyber: where an infrastructure depends on information transmitted through the information and communications infrastructure (a reliance on information transfer between infrastructure);
- iii. Geospatial: co-location of infrastructure components within the same footprint (where two or more infrastructures are co-located, such as in a common utility corridor, and can be affected by a local event);
- iv. Logical: where the state or condition of an infrastructure depends on the state of another infrastructure in a way that is not physical, cyber, or geographic (for example, linkages through financial markets).

Critical Infrastructure Protection (CIP)

1. The strategies, policies, and preparedness needed to protect, prevent, and when necessary, respond to unplanned interruptions on critical infrastructure sectors.
2. The study, design and implementation of precautionary measures aimed to reduce the risk that critical infrastructure fails as the result of war, natural disaster, terrorism, civil unrest, vandalism, or sabotage.

Decision Analysis

The discipline of assessing the value of alternative actions, taking into account the costs of taking the action, the likelihood of future uncertain actions that may occur if the action is taken, and the rewards or costs estimated to result.

Disaster

Any event or condition, of natural or human origin, accidental or deliberate, which overwhelms the ability of a vulnerable community, system or infrastructure to withstand immediate or likely effects, which are likely to cause severe harm, loss and damage.

Emergency

An abnormal situation or event, either present or imminent, which requires prompt actions, beyond normal procedures, to protect the health, property and welfare of people, or to limit damage to property or the environment, or functioning of the government

Emergency Management

The process of conducting activities, including risk management measures, that will help prepare for, prevent or mitigate against, respond to or recover from all types of emergencies.

Hazard

A substance, human activity or situation that has the potential for causing human injury or loss of life, damage to property, environmental degradation, social and economic disruption or a combination of the above, or functioning of the government.

Hazard Analysis

A critical examination of hazards and their probability in contributing to an unfavourable event.

Hazard Identification

The recognition of a substance, activity or situation contributing to risk.

HAZOP (Hazard and Operability Studies)

A qualitative approach to risk analysis, employed extensively at the planning stage of projects. It views the process from a hazard point of view and breaks it down into manageable parts before being closely examined for hazards. It lays down a logical framework by the use of guide words to find faults.

High Risk

A condition where there is a high probability of occurrence of a risk event and the effect or the magnitude of consequences is potentially high.

High-Consequence Risk

An event with low probability of occurrence but with potentially severe consequences.

Impact

The extent to which a risk, should it occur, has an effect on population, economy, environment, government structure or functioning, or the society as a whole. The impact per occurrence may be assessed quantitatively (quantitative units are flexible; they include monetary units, time units, number of fatalities, number of casualties, etc.) or, in more complex cases, qualitatively (in qualitative units such as None, Low, Medium and High).

Infrastructure

The services and facilities that must be in place in order for a country or area to function as an economy and as a state, including the capital needed for transportation, communication, provision of water and energy production, transmission and distribution, and the institutions needed for security, health, and education.

Institutionalization

The building of infrastructure and corporate culture that supports methods, practices, and procedures so that they are the accepted way of doing business, even after those who originally defined them is gone.



Life Cycle

The succession of stages in the existence of a policy, program or project, from the original concept, through development, implementation and to its expiration and/or replacement.

Method

A reasonably complete set of rules and criteria that establishes a precise and repeatable way of performing a task and arriving at a desired result.

Methodology

A collection of methods, procedures, and standards that defines a synthesis of approaches.

Milestone

Identifiable point in a project or set of activities that represents a reporting requirement or completion of a large or important set of activities.

Mitigation

A strategy that decreases risk by lowering the probability of its occurrence and/or reducing the severity/impact of its consequences, should the risk occur.

Monte Carlo Analysis

A technique in which outcomes of events are determined by selecting random numbers subject to defined probabilities. The process is done on an iterative basis to determine expected outcomes and their probability distribution.

Natural Hazards

Naturally occurring phenomena, originating within the geophysical or biological environment, with potentially adverse consequences.

Odds

The ratio of probabilities of occurrence and non-occurrence. (e.g., the odds of getting a 4 on the throw of a single die are 1 to 5)

Policy

1. A set of broad government objectives to be attained through a number of related specific programs or activities.
2. The official direction for a program consisting of desired objectives and the means to achieve them.

Prevention

Actions taken to avoid the occurrence of negative consequences associated with a given threat; prevention activities may be included as part of mitigation.

Probability

The likelihood that the risk will occur. The assessment of a probability may be expressed in qualitative or quantitative terms.

Procedure

A written description of a course of action to be taken to perform a given task.

Process

A set of activities performed for a given purpose.

Qualitative Assessment

A risk assessment that is stated in terms such as “none”, “low”, “medium” or “high”. Such assessments are usually subjective, and are inherently difficult to compare because of differences among assessors or differences in experience if they are from a single assessor.

Quantitative Assessment

A risk assessment that is stated in terms of numerical values. Such assessments can be developed from data describing previous similar events, and can be more objective and more easily compared. There may still be some subjectivity because of the necessity to choose appropriate events; especial care is needed if there are no precisely similar events and analogous events must be used.

Resilience

The capacity of a community, system or infrastructure potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.

Resistance

The ability to withstand impacts so that inevitable damage from an extreme event does not reach disaster proportions.

Risk

Risk refers to an unfavourable condition or event measured by the compound estimate of the probable frequency or possibility of occurrence and the severity of consequences, including psycho-social effects associated with the condition or event.

Risk Analysis

Risk Analysis is the systematic use of available information to identify hazards and to estimate the risk to individuals or populations, property or the environment, or to government structure and functioning. The purpose of risk analysis is to identify the cause, effects and magnitude of risk perceived; it is the basis for risk assessment and it informs risk acceptability.

Risk Assessment

Risk assessment is the overall process of risk analysis and risk estimation. It is the on-going process that includes:

- identifying risk conditions or the possibility of risk events;
- reviewing the identified risks in the context of existing/proposed mitigation measures;
- estimating the likelihood and the damage, loss, or harm that could result from each of the identified risks;
- aggregating a risk estimate for each identified risk to ensure that they are understood and can be prioritized.



Risk Avoidance

A mitigation strategy that in effect eliminates the threat of a specific risk, usually by eliminating its potential cause.

Risk-Based Decision-Making

The concept that sound decision-making will be based on an assessment and evaluation of hazards, risks and vulnerabilities.

Risk Communication

An interactive process of exchange of information and opinion about a risk among individuals, groups, and institutions. It often involves multiple messages about the nature, form, likelihood, severity, acceptability, treatment or other aspects of a risk, carried among risk assessors, risk managers, risk assessment users and other interested parties in order to achieve a better understanding of risk, risk management, risk-related issues and decisions.

Risk Criteria

Established principles, rules or standards used to evaluate hazards or threats.

Risk Estimation

The scientific determination of the characteristics of risks, usually in as quantitative a way as possible. These include the magnitude, spatial scale, duration and intensity of adverse consequences and their associated probabilities as well as a description of the cause and effect links.

Risk Evaluation

The stage at which values and judgments enter the decision process explicitly or implicitly by including consideration of the importance of the estimated risks and the associated social, environmental and economic consequences in order to identify a range of alternatives for managing the risks.

Risk Identification

A deliberate process to review and transform uncertainties surrounding unfavourable conditions or events into well-articulated risks that can be described and/or measured. Identifying risks involves two activities:

- i. capturing a statement of risk
- ii. capturing the context of a risk

Risk Management

The continuous, proactive and systematic process of identifying, assessing, evaluating, acting on and communicating about risks. The risk management process typically consists of identifying what may happen, how it may happen, why it may happen, assessing the consequences of it happening, deciding whether to accept the risk in whole or in part and taking appropriate action, including a communication strategy.

Risk Perception

The subjective judgment that the members of the public and/or other interested parties make about the characteristics and severity of a risk.

Risk Profile

An organization's risk profile involves taking stock of the organization's operating environment and its capacity to deal with key high-level risks linked to exercising the organization's mandate or achievement of the organization's objectives.

Risk Register

A file or computer database that lists all the identified risks and the results of their analysis and evaluation. Information on the status of mitigation efforts is also included. The risk register should be continuously updated and reviewed.

Risk Statement

Statement of condition, probability and effects of the consequences, to define the likelihood and impact of an event.

Role

Defined responsibilities that may be assumed by one individual, a group of individuals or an organization.

Standard

Mandatory requirements employed and enforced to prescribe a disciplined, uniform approach to development, acquisition, maintenance and disposal.

Taxonomy

A schema that partitions risk into logical categories and defines the relationships among them; it is used for classifying and understanding the risk domain.

Threat

1. The combination of capabilities, intentions, and attack methods of adversaries to exploit, damage, or alter in order to cause harm to a system, environment, or population;
2. The combination of the presence of a hazard and a sequence of events through which it may cause harm.

Uncertainty Analysis

1. A detailed examination of the systematic and random errors of a measurement or estimate;
2. An analytical process to provide information regarding uncertainty.

Vulnerability

1. A condition or set of conditions in a community, system or infrastructure that may allow a hazard or a threat to harm the safety, health or welfare of people, or to cause damage to property, environmental degradation, or social and economic disruption.

Working Group

An assemblage of personnel organized to serve a specific purpose or accomplish a task.



References.....

An Emergency Management Framework for Canada”, published by Emergency Management Policy Directorate, PS Canada

Termium, the Government of Canada’s terminology and linguistic database,
http://termiumplus.gc.ca/site/accueil_home_e.html

“International Risk Management Lexicon”, edited by Kevin W Knight, chairman, International Federation of Risk and Insurance Management Associations (IFRIMA), published by IFRIMA, PO Box 226, Nundah Q 4012, Australia, April 1994

Society for Risk Analysis (SRA) – Glossary of risk analysis terms,
http://www.sra.org/resources_glossary.php

Decision Analysis Society (DAS) of the Institute for Operations Research and the Management Sciences (INFORMS) – Lexicon of decision-making, <http://decision-analysis.society.informs.org/Field/FieldLexicon.html>

Treasury Board Secretariat (TBS) – Lexicon, http://www.tbs-sct.gc.ca/emf-cag/ppto-gtpss/lexicon-lexique/lexicon-lexique_e.asp

Vice Chief of Defence Staff (VCDF) Office, Defence Planning and Management,
http://www.vcds.forces.gc.ca/dgsp/00Native/dp_m/risk-man/risk-def_e.pdf

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