Risk Management Models and the Disaster Mitigation Process

by

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Abstract

Recent increases in public interest and awareness of environmental health risk and disaster mitigation issues have led to demands for information and accountability: information from government and industry on the nature of their policies, production, and risk management strategies, and, accountability when these same agencies expose the public to risk of damage, injury, or accident. With respect to natural hazards, the public wants to know both their level of exposure and the government's strategy for disaster mitigation - or reducing the exposure to risk. In the last decade North America witnessed a revitalized public: perhaps it is because the public are more informed about risks and disaster effects and therefore better able to partake in decision making, or, perhaps the public is disturbed that the role and nature of governments has traditionally placed political, economic, and business interests at the forefront of risk decision-making issues. Concern in the public and private spheres of activity is now centred on reducing the amount and types of risk producing behaviours and activities to which the public and the environment will be exposed. This is known as the disaster mitigation process.

This thesis will address a set of complex factors in the processes of risk management and the disaster mitigation

process. I will examine the major risk management models utilized in North America and ascertain how they attempt to effect public inclusion in disaster mitigation and environmental health risk decision-making. Specifically, I will examine the roles of public perception, risk communication, and acceptable risk, and, the impact of race, ethnicity, and language on these factors.

It will be shown that, overall, these traditional models are ineffective as proactive risk reducing and disaster mitigation strategies. In an attempt to overcome these limitations an alternative model has been formulated. This alternative model intends to improve the communication exchanges between government and affected parties, (more specifically, the public,) thereby ensuring the affected parties are fully involved in all aspects of decision-making. This should address the demands of the public, and as well, reduce conflicts and criticism once a decision strategy has been adopted. The proposed model also includes a proactive strategy. I suggest that this proactive model will improve environmental health risk education and disaster mitigation, thereby reducing the conflict created when the existing reactive models are implemented.

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CHAPTER 1

Introduction

Humankind has been exposed to risk since the beginning of time. Through the centuries we have been faced with risks that parallel those we face today. Whether it was the risks of exposure to the Black Death, the great plague of Fourteenth Century Europe,[1] risks to health in the mines of 19th Century England, or risks of fire such as the Great Fires of London in 1666 and San Francisco in 1906, we have always been concerned with reducing our exposure to all classes of risk.

Historically, governments have protected and safeguarded the public from particular risk via the introduction of such things as fire departments and fire codes after the great fires, health policies and practices after the great plague, and employee safety codes after major industrial accidents.[2] Today the public is demanding not only that they be protected from exposure to certain kinds of risk,

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[1] Covello, Vincent, T. and Jerry Mumpower. 'Risk Analysis and Risk Management: A Historical Perspective' in R. Stephen McColl, Ed., Environmental Health Risks: Assessment and Management; University of Waterloo Press, Ontario. 1987. p. 11.

[2] Ibid. p. 16.

but also that they be included in the risk management process and be both educated and informed in disaster preparedness and mitigation techniques: not surprising when in the last two decades the public has been exposed to a variety of large scale risks: chemical spills; oil spills; toxic releases; nuclear radiation releases; earthquakes; tsunamis; volcano eruptions; and, major fires.

Because of this seeming increase in disasters, the mid-1980s saw the United Nations declaring 1990 the beginning of the "International Decade for Natural Disaster Reduction" (IDNDR). The aim of the decade is to

> bring together the various protagonists who so far have usually played parallel but separate roles in disaster management - governments, aid agencies, the disaster relief community, the scientific world, and the general public. The IDNDR is, in fact, a global attempt to change the perceptions of most of these actors from being able to merely respond to disasters to being able to anticipate them and take action to prevent them from happening.[3]

In this thesis I will examine the capability of the existing risk management process to affect this change in perception. Before proceeding, I shall first identify the terms that will be used throughout this document: "disaster", "mitigation", and "risk".

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[3] Ibid. p. 419.

There are several definitions for "disaster" and for the most part they are definitions that focus on the reactive aspect of disasters - they tend to all make reference to the limited ability of some group of people to effectively respond to the event in question. Typically this means that when a disaster response agency (government or private - including the public) is overwhelmed and unable to effect recovery without the assistance of an "outside" (other) agency, a disaster has taken place. However, a more useful definition, and the one used here, is the definition formulated by the United Nations Ad Hoc Group of Experts: a disaster "is a disruption of the human ecology which exceeds the capacity of the community to function normally, unless disaster preparedness and mitigation measures are in place".[4]

"Preparedness" refers to those activities that take place before an event has occurred and are geared towards ensuring that disaster managers have tools at hand to cope with the event when it occurs.[5] "Mitigation" describes "[t]hose measures and activities aimed at reducing or eliminating hazards associated with [natural disasters], or lessening

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[4] Hays, Walter W. 'Perspectives on the International Decade for Natural Disaster Reduction' in Earthquake Spectra. California:Earthquake Engineering Research Institute. Volume 6, Number 1. 1990. p.126.

[5] Ibid. p.126.

the impact of the event".[6] In this instance the activities are specifically geared towards the reduction of loss of life and damage.

Definitions of risk differ internationally, but it is widely accepted that risk involves, in the primary stages, "probability" and "hazard". The definition utilized for this thesis is:

> a "measure of both the hazard to health from exposure to a substance and the probability of its occurrence". Thus risk is a function of both the nature [of] a particular hazard arising from a product, process, or natural occurrence, on the one hand, and the probability (for a person or non-human species) of encountering that hazard and suffering an adverse effect on the other.[7]

Disaster preparedness and mitigation are terms that indicate the risk management process, specifically as it relates to natural hazards. Preparedness is akin to hazard identification, and mitigation is akin to risk management in the models to be described later in this chapter.

[6] British Columbia Earthquake Response Plan (Interim). Victoria:Provincial Emergency Program. Ministry of Attorney General. 1992. p 95.

[7] Leiss, in Salter, Liora, and Wolfe, David. (eds). Managing Technology:Social Science Perspectives. Garamond Press. Toronto. 1990. p. 191.

Risk

Kates and Kasperson suggest that society has become focused on risk because we are affluent and have the time to be concerned.

> Real gains in the extension of life, the control of infectious diseases, the elimination of hunger, and the mitigation of insecurity from unemployment and old age have produced an affluent society than can better afford to concern itself with risk.[8]

However, Boulle suggests it is the growing population and physical infrastructure in hazard prone areas that has increased the effects of natural disasters, and, also made us more aware of our exposure to risk[9].

Wilson and Crouch (1982) suggest that risk can be divided into three categories: unknown, large, and negligible.[10] The object of the risk assessment is to move an unknown risk into one of the other categories so that a risk management decision can be made. Therefore, it is with unknown risks

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[8] Kates, Robert, W. and Jeanne X. Kasperson. 'Comparative Risk Analysis of Technological Hazards: A Review'. in Risk Abstracts 1:3:1984. p.110

[9] Boulle, Philippe L. 'Will the 1990s be a Decade of Increasingly Destructive Natural Disasters?' in Natural Hazards. Dordrecht: Kluwer Academic Publishers. Volume 3, No. 4. 1990. p. 419.

[10] Wilson, Richard. and Edmund A.C. Crouch. Risk/Benefit Analysis. Cambridge, MA. Ballinger Publishing Company. 1982. p.92.

that risk assessors are most concerned. Shrader-Frechette (1985) suggests that it is the controversial nature of the "unknown" risk that causes it to be examined in detail because "[n]early everyone is already convinced that large risks ought to be avoided and small risks are not worth worrying about."[11]

The 1980s saw an upsurge in expert interest in risk management and several risk management models were developed. These models form the basis of most risk management strategies used today. I will briefly examine the models before moving on to a more in depth discussion of some of the key components.

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[11] Shrader-Frechette, K.S. Risk Analysis and Scientific Method. Dordrecht, Holland: D. Reidel Publishing Co., 1985. pp 18-19.

Risk Management Models

SCOPE (1980)	NRC/EPA (1983)	ROYAL SOCIETY (1983)	ICTC (1984)	WHO (1985)
RISK IDENTIFICATION	RESEARCH HAZARD IDENTIFICATION	RISK	HAZARD IDENTIFICATION	HAZARD IDENTIFICATION
RISK ESTIMATION	DOSE-RESPONSE ASSESSMENT EXPOSURE ASSESSMENT RISK CHARACTERIZATION	ESTIMATION	RISK ESTIMATION	RISK ESTIMATION
RISK EVALUATION	DEVELOPMENT OF REGULATORY OPTIONS EVALUATION OF OPTIONS	RISK EVALUATION	DEVELOPMENT OF ALTERNATIVE COURSES OF ACTION DECISION ANALYSIS	RISK EVALUATION
RISK MANAGEMENT	DECISIONS AND ACTIONS	RISK MANAGEMENT	IMPLEMENTATION MONITORING AND EVALUATION REVIEW	RISK MANAGEMENT

Figure I[12]

Most risk management strategies employed in North America have been developed out of structures set in place by a core of early risk management models. Formulated for the most part during the early 1980s, these risk management models differ in structure, but tend to contain the same basic elements.

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12 Krewski, Daniel. and Birkwood, Patricia L. "Risk Assessment and Risk Management" in Risk Abstracts. Volume 4. Number 2. April 1987. p. 58.

Scientific Committee on Problems of the Environment (SCOPE)

One of the first important models to appear was formulated by SCOPE.[13] This model defines three stages of risk: risk identification; risk estimation; and risk evaluation. After first "simply recognizing" the existence of a hazard, a scientific assessment takes place followed by an evaluation of its significance, acceptability, and consequences. The risk management sphere decides on any action or procedure to be undertaken.

National Research Council (NRC)

The NRC developed a two stage model comprised of risk assessment and risk management. Of all the early models, the NRC was the most popular and was adopted by several U.S. regulatory agencies.[14] In this model risk assessment is broken down into four sub-categories: hazard identification; dose response assessment; exposure assessment; and risk characterization. Hazard identification in this model refers to the identification of cause-effect relationships utilizing epidemiological studies, animal test data, mutagenicity tests and molecular structure data.[15] Dose response studies involve the analysis of rate of exposure and probability of health effects. Exposure assessments

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[13] Ibid. pp. 53-54.

[14] Ibid. p. 54

[15] Ibid. p. 54.

health occurring after the implementation of a control action. Risk characterization includes all of the above components as well as the nature and magnitude of the risk and the associated uncertainty.[16]

The risk management sphere is subdivided into three further categories: development of regulatory options, evaluation of options, and decisions and actions. Many factors are considered in the risk management sphere, including socio-economic impacts, political considerations, scientific uncertainty, and public perception. However, the public and/or interested parties are "merely" informed of any decision that is made. These same parties are not active participatory members of the decision-making strategy:

> The implementation of a specific course of action should be accompanied by the communication of information concerning the basis of the decision to affected parties.[17]

Royal Society (RS)

The RS model is comprised of two stages, the first of which, risk assessment, is subdivided into risk estimation and risk evaluation. The risk estimation sphere is concerned with identification and probability of exposure, while in the risk evaluation sphere an interrelated set of components come together to reveal the "significance" or "value" of a

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[16] Ibid. p. 54.

[17] Ibid. p. 54.

given hazard to the affected parties.[18] Public perception and acceptability are also considered in this sphere. The second stage, risk management, is the decision-making domain and the public are involved in the consultation stages. However, while "public awareness, perception and acceptability" are considered, and the public is consulted regarding the risk reducing decision, the process is top down and remains in the expert (public policy) domain.

Interdepartmental Committee on Toxic Chemicals (ICTC)

The ICTC, a Canadian model, is an elaboration of a model proposed by Lave.[19] This model was specifically intended to address risks related to toxic chemicals. It is very similar to the SCOPE model - any decision on course of action is made prior to the risk management sphere although a monitoring and review process are built into the structure.[20] Consideration may be given to the public's perception, but not necessarily so, in fact:

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[18] Ibid. p. 54.

[19] Krewski, Daniel. 'Risk & Risk Management: Issues and Approaches' in Environmental Health Risks: Assessment and Management. R.S.McColl ed. university of Waterloo Press, Waterloo, Ontario. 1987. p.32.

[20] Ibid. p. 54-55.

> Implementation of the selected risk management strategy ... should be accompanied by attempts to communicate the nature of the chosen control mechanism to all affected parties.[21]

This model was later modified by Leiss in two ways. First he proposed a second line of process running parallel to the hazard identification stage, a process that would factor all the benefits. Secondly, in the risk management sphere he includes procedures that would allow for peer review, the exchange of documentary information between all interested parties, and the requirement to clarify all regulatory decisions.

World Health Organization. (WHO)

The WHO model has a four stage formulation: hazard identification; risk estimation; risk evaluation; and risk management. While science, industry, special interest groups, the media, public, and politicians can influence each stage, it is only in the risk evaluation stage that it is specified that "consideration is given to political factors, public perception and industrial & public liability".[22] The risk identification and risk estimation stages are firmly in the hands of the scientific experts.

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[21] Krewski. p.34. Emphasis mine.

[22] Ibid. p. 57.

Health and Welfare Canada: Health Protection Branch

At the beginning of 1990, the Health Protection Branch (HPB) of Health and Welfare Canada developed a two stage risk management model.[23] Inherent in the framework of this model is the understanding that all Directorates use the same data for hazard identification, e.g, toxicological or epidemiological studies.[24] Additionally the HPB's model is based on an underlying premise that the government has a responsibility to facilitate communication between the public and experts.

> Government has a responsibility to mediate the exchange of information between technical experts and the public, to enhance public understanding of risk and ensure that the views of the general public are considered when important decisions are made.[25]

In the HPB's model the first stage of risk assessment is comprised of hazard identification and risk estimation. Hazard identification is simply defined as involving "recognition that a particular chemical can be a health hazard".[26] In order to identify potential health risks a plethora of epidemiological and toxicological studies are undertaken.

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23 Health and Welfare Canada. Risk Management in the Health Protection Branch. Dept. of Supply and Services. 1990. p. 19.

24 Ibid. p. 13.

25 Ibid. p. 10.

26 Ibid. p. 9.

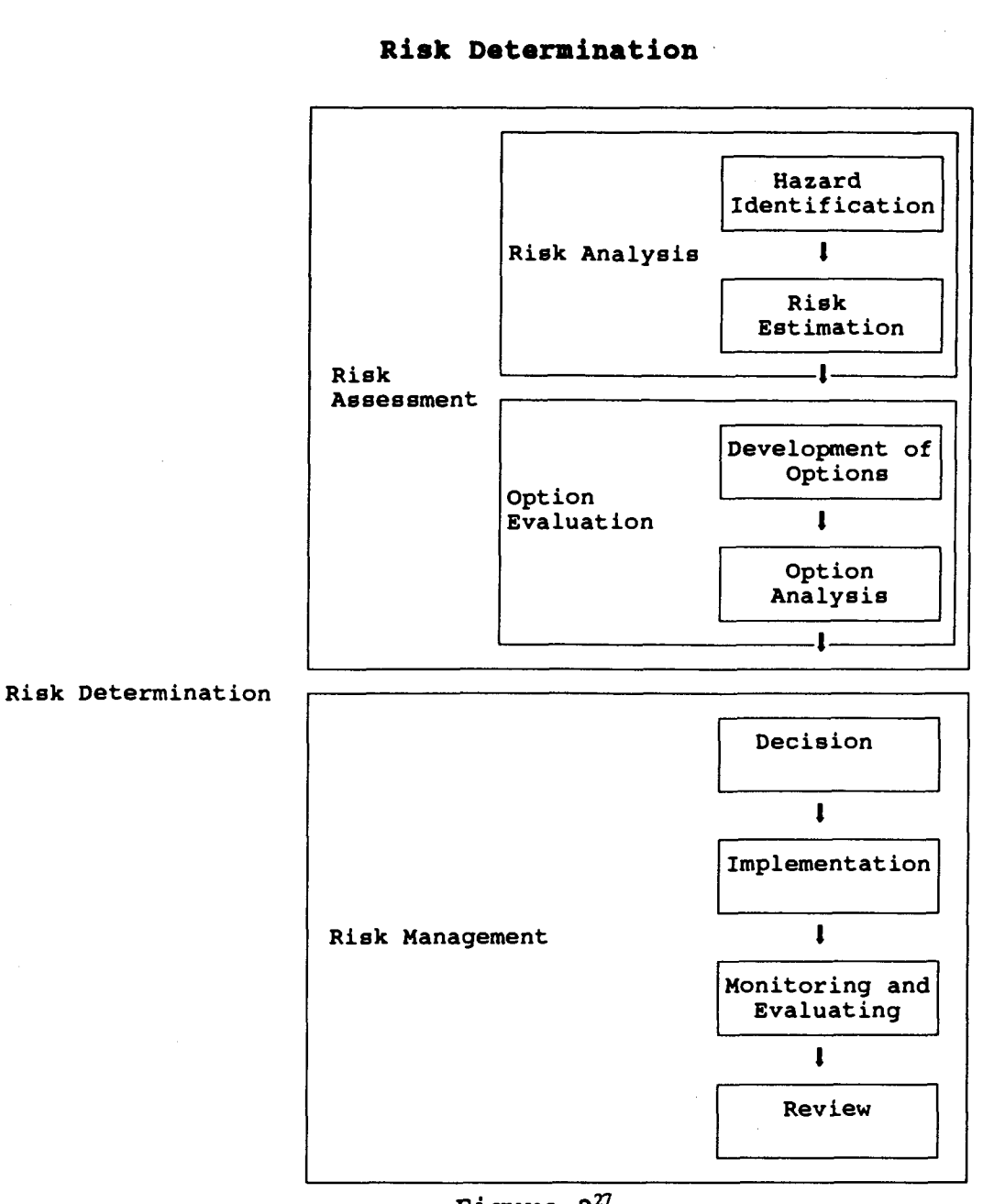

Figure 2[27]

The next step in the risk assessment process is to estimate the level of risk. As with the early risk models the HPB rely on several different approaches - each approach

[27] Ibid. p.2.

dependent upon the circumstance. For example, the "practice of not permitting the use of food additives having human carcinogenic potential"[28] should produce zero risk; for additives in food in which no adverse health effects are observed at a certain dose level, an **acceptable daily intake** is calculated from dividing the **no-observed effect level** by the **safety factor.**[29] The **threshold limit value** is also established in a similar fashion in order to control workplace exposure.[30]

The third step in the risk assessment sphere of activity is a two phase process: the development of options and option analyses. In this category a discussion ensues as to the changing nature of federal government involvement in regulatory processes. While there are federal and provincial statutes (Food and Drug Act, Quarantine Act, etc.) in place to protect human health, the federal government "has begun to withdraw its exercise of authority from areas of concurrent jurisdiction".[31] Further, as a result of the recommendations of the Ministerial Task Force

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[28] Ibid. p. 12.

[29] Ibid. p. 32.

[30] Ibid. p. 32. A discussion on the applicability of the threshold concept to carcinogenesis and mutagenesis can be found in Risk Management in the Health Protection Branch. p.32-33.

[31] Ibid. p. 40.

on Program Review (1985-86) the federal government has moved towards regulatory reform including increasing "the public's role in the regulatory process" and increasing "regulatory cooperation with the provinces, especially as it pertains to overlap and duplication."[32] This will be discussed in more detail later.

In the present model, common agreement between agencies determines who will lead the response: many environmental health issues can involve several departments as well as several provincial ministries (e.g., Provincial Emergency Program, Ministry of Health, Ministry of Environment, Health and Welfare Canada, Agriculture Canada, Transport Canada, Emergency Preparedness Canada).

The activities defined in the option evaluation sphere reveal an interplay between pro-action and re-action in the HPB model. Three types of economic options are revealed; compensatory options, levies, and financial support. These actions would secure compensation to cover losses suffered by "risk producing behavior" (including some kind of compensatory or insurance scheme for the offender to ensure that "the offender does not suffer severe financial loss as a result" of claims);[33] levies such as "polluter pays"

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[32] Ibid. p. 42.

[33] Ibid. p. 42.

initiatives, and as well, economic gains for reducing risk producing behaviour; and financial support for the "development and adoption of new technologies or procedures to reduce risk."[34]

Advisory options are aimed at both those producing the risk and those "consuming" the risk. The strategy adopted for the risk producers includes such things as the setting of standards and guidelines, and research and development initiatives. The options directed to the risk consumers include public awareness campaigns through the use of the mass media or other information channels, worker information strategies to ensure employees are fully conversant with the occupational risks they may encounter, and finally, releasing either adverse publicity or "nonaccusatory" publicity about specific risk producers and their behaviours to members of the public.[35]

The final options are technological options which, it is suggested are "favourable to both government and industry" because this option allows for flexible use of technologies to introduce risk reduction strategies.[36]

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[34] Ibid. p. 43.

[35] Ibid. p. 44.

[36] Ibid. p. 44.

In risk management, we see the decision, implementation, monitoring and evaluation, and review spheres. However, any resulting decision "is made by the appropriate authority" and it is stipulated that an effective risk communication strategy should "enhance the public's confidence in the authority that made the decision."[37] It is not indicated that the public should be part of the decision making team.

Risk Estimation

Once the hazard has been identified an estimation of the risk must take place. Although it is generally accepted that a state of "zero risk" is unobtainable (with the exception of food additives that have the potential to be carcinogenic to humans) the classification of "zero risk" attempts to prevent any activity that involves risk. Consistency is one of the identifiable problems in this category because, using the same data, experts can disagree on potential risk level.

As Low As Reasonably Achievable (ALARA) is an approach where risk is reduced as much as possible. Some measure of acceptability is needed. "A decision rule is needed for specifying what is reasonable, a rule that ultimately

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[37] Ibid. p.7

depends on physical limits... and the cost of implementation."[38]

Another approach is "Best Available Control Technology" (BACT). Here again there is an attempt to reduce the risk-producing activity, but it is often not economically feasible to employ BACT. The costs can be prohibitive and opinion can differ on what constitutes the BACT.

The "de minimis" risk concept, where low risks are seen to be trivial and not worthy of management, is problematic because of lack of consensus on the nature of "trivial"[39].

In "risk/risk" analysis three types of comparative analysis are undertaken: "natural or background levels of risk, risk associated with other comparable hazards, and risk of alternatives".[40] Comparative risks are problematic because they do not leave the public with a clear understanding of the level of risk under discussion.

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38 Wilson, A.C. & Edmund Crouch. Risk\Benefit Analysis; Ballinger Publishing Company: Massachusetts. 1982. pp. 92-93.

39 Health and Welfare Canada. p. 46.

40 Ibid. p. 46.

The U.S. National Science Foundation utilizes the following methods to estimate risk:

> Risk-Source Characterization: A description of the characteristics of the risk source that have a potential for creating risk (e.g., types, amounts, timing, and probabilities of release of toxic substances, energies, etc.).
> Exposure Assessment: Measurement or estimation of the intensity, frequency, and duration of human or other exposure to the risk agents produced by a source of risk.
> Dose-Response Assessment: Characterization of the relationship between the dose of the risk agent received and the health and consequences to exposed populations.
> Risk estimation: The process of integrating a risk-source characterization with an exposure assessment to produce overall summary measures of the level of health, safety, or environmental risk being assessed.[41]

Risk Evaluation

Next an evaluation of the risk must be made. What must be ascertained is the potential of a substance to cause an environmental health hazard. In order to do this some formulation of value must be assigned the given elements. The most common approaches used to formulate a value and evaluate risk include: Cost-Effective Analysis (CEA), Benefit-Cost Analysis (BCA), Risk Benefit Analysis (RBA), Socio-Economic Impact Analysis (SEIA), Environmental Impact Analysis (EIA), and Regulatory Impact Analysis Statements (RIAS).

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[41] Leiss, William. in Salter and Wolfe. p. 191-192.

A Cost Effective Analysis attempts to obtain a predetermined goal by the lowest possible monetary outlay and to achieve this end, examines all the aspects of the process under review. A Risk Benefit Analysis differs from a Cost Effective Analysis in that there is no predetermined goal, rather trade-off is the key.

> [I]t is the relationship between potential risks to health on the one hand, and anticipated (net) benefits derived from the use of the product on the other, that must be weighed.[42]

A Benefit Cost Analysis has all the eggs in the same basket - health risks, benefits, costs, together with all alternative methods and respective health risks, benefits, and costs. Assessed competitively a BCA assumes a "market" model and makes decisions based on assumptions of the market.

A Socio-Economic Impact Analysis extends the assessment of the BCA in that it looks not only at one aspect of the market, but also at all conceivable aspects of the market: "international trade, rate of inflation, employment, distribution, and so forth".[43] SEIAs are mandatory for "any

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[42] Leiss, William. The Risk Management Process. Agriculture Canada. Food Production and Inspection Branch. 1985. p 11.

[43] Ibid. pp. 12-13.

new [federal] government regulation pertaining to health, safety or fairness which is anticipated to result in major costs".[44] The Health Protection Branch define SEIAs as assessing:

- effects of market efficiency, in terms of production and consumption,
- distribution of income,
- market structure,

Environmental Impact Analysis assesses the effect of proposed legislation on the environment, but, while the federal government can conduct EIA, they are not obligated to include the assessment in any resulting policy recommendations.

> The environmental assessment review process guidelines require an assessment to be done on federal projects likely to effect the environment....
> But the court also rules that the cabinet is not bound by the government's environmental assessment guidelines when making policy decisions. [45]

The Treasury Board employs Regulatory Impact Analysis Statements for all regulatory proposals, regardless of cost. RIAS detail the course of actions previously undertaken and/or considered, and discuss the non-regulatory

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[44] Health Risk Determination. 1990. p. 25

[45] 'Court rules environmental concerns don't bind cabinet'. Vancouver Sun: July 5th, 1990. A8.

alternatives to regulatory action. A SEIA also forms part of this assessment.

> [RIAS]: A mandatory statement to be filed with all proposed changes in federal government regulations, detailing the rationale, alternatives considered, probable impacts, consultations with affected parties, and compliance mechanisms. The description of a regulation must be accompanied by an account of technical and policy alternative, and why they were rejected; anticipated impacts, benefits, and costs, both direct and indirect, on business and industry, labour, governments, and consumer; the consultations undertaken and the responses to them; and enforcement provisions. [46]

In the next chapter I will present some of the issues that pertain to the risk management debate. In particular, I will examine scientific uncertainty, risk communication, public perception, and public acceptability, and will demonstrate how these factors impact the risk management and disaster mitigation process.

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[46] Health and Welfare Canada. p. 124.

Chapter 2

Risk Management: The debate

It can be seen from Figures 1 and 2 in Chapter 1 that the models are all quite similar. The four basic components, hazard identification, risk estimation, risk evaluation, and risk management, are all present and all involve some form of scientific methodology in the hazard identification and risk estimation stage, and incorporate public policy and socio-economic factors in the risk evaluation and risk management stage. While it is not explicit in any of the models, the hazard identification stage will also include those kinds of scientific studies that pertain to natural disasters, such as seismic evaluations and geological reports.

Public perception and acceptability are mentioned in most of the risk evaluation spheres with the exception of the RS model where they are included in the management sphere. However, it is far from clear in all cases whether public perception and acceptability are simply considered by the policy makers, or, whether active public participation actually occurs in the process.

In the risk management sphere most of the models, with the exception of SCOPE, include some form of risk communication

as a top down strategy but it is only in the RS model that the public is specifically included as an interactive component.[47] In Chapter 4, I will present several case studies that indicate the critical role of public perception and how this perception, and any required risk communication strategy, is affected by race, ethnicity and language - factors that the existing models are ill equipped to deal with.

We can see then that while the NRC, RS, ICTC and WHO models "stress the importance of communication at the implementation stages so that affected parties are properly informed as to both the nature of the risk and the risk management strategy adopted",[48] none of the models adequately include the full and active participation of the public or "affected parties" from the initial hazard identification through to the decision making. At best, "affected parties" are informed of the "nature of the risk" and the management strategy, but not involved in the identification of the risk and the management process as a whole. This seriously impairs any disaster preparedness and mitigation activities in the public sphere. The HPB model does include public participation but there are some

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[47] Ibid. p.58.

[48] Ibid. p. 59.

limitations to the process. These are discussed in the later risk communication section. The options defined in the option evaluation sphere are a mixture of pro- and re-active measures.

In all the models hazard identification is in the domain of the scientific experts and risk management is the domain of public policy experts. Krewski suggests that this distinction should remain: scientists should be concerned with risk analysis and public policy makers should be concerned with the implementation of the risk management decision.[49]

It is this distinction that I suggest is problematic. In all the risk management models scientific methodologies are utilized to establish the hazard identity. These methodologies usually include epidemiological studies and toxicological (laboratory) tests and are firmly in the hands of the scientific experts. This process fails to incorporate the perception and acceptability issues, issues that are central in the disaster management field, because they are "soft" and unquantifiable. However, perception and acceptability are central factors in the disaster mitigation arena because these attributes shape specific responses. The case studies outlined in Chapter 4 will emphasize this

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[49] Krewski. p. 34.

point. This reliance on scientific values creates a limited set of options for decision management: "Laypeople have different, broader definitions of risk, which in important respects can be more rational than the narrow ones used by experts".[50]

Risk Assessment and Scientific Uncertainty

Covello suggests that in the first stage of risk assessment we are faced with a quandary: the strength of risk assessments is that they require a rigorous systematic delineation of complex data, further, this data is translated into the "precise language of numbers" thereby minimizing ambiguities.[51] The weakness in this strategy is that it requires a set of assumptions to form the basis of any further risk management decision. In the scientific sphere these assumptions are reflected in scientific uncertainty.

> Specifically, uncertainty in health and environmental risk assessments derive from four given sources: (1) statistical randomness or variability of nature (e.g., variability due to differences between individuals in their susceptibility and responses to low doses of chemical radiation); (2) lack of scientific knowledge, e.g., lack of knowledge about mechanisms by which low

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50 Morgan, Granger, M. 'Risk Analysis and Management' in Scientific American. July 1993. p. 32.

51 Covello. 'Limitations of Scientific Data about Health and Environmental Risks' in Leiss. W,. (ed) Prospects and Problems in Risk Communication. 1989. p. 2.

> doses of chemicals or radiation produce particular adverse effects, including cancer and reproductive effects; (3) lack of scientific data, e.g., lack of laboratory and epidemiological data about the toxicological effects of low doses of chemicals or radiation; and (4) imprecision in risk assessment methods, e.g., imprecision due to variation in protocols for the conduct of laboratory or field studies of exposure to chemicals or radiation.[52]

Though sometimes problematic in the scientific community, this uncertainty takes on a new meaning in the public sphere where it manifests as lack of trust in government and industry. Much confusion is evidenced when the public attempt to tackle issues involving uncertainty because often, the scientific experts disagree on the level of uncertainty and how it should best be handled, and, they place little importance on how this is perceived by the public.

Moser suggests there are three levels of scientific uncertainty. The first level refers to methodological limitations. "This is the kind of uncertainty that scientists tend to cite as missing in media reports."[53] The next level is epistemological uncertainty. Moser discusses both these levels in terms of uncertainty based on limited

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[52] Ibid. P. 3.

[53] Moser, Mary Ann. 'Scientific Uncertainty and the Media'. Presented at the Canadian Communication Association Conference. University of Victoria, June 1990. p.3.

information. Finally, subjective factors, the third level, produce inherent uncertainty.

Moser suggests that scientists, while being aware of public misconception, are also instrumental in shaping those misconceptions. Scientists tend to report on the positive aspects of their research findings, downplaying the negative, and, scientists communicate with their peers and the media in very different ways.

> If I'm talking to a journalist, I'm going to talk about what we know. And I'm going to explain as best as possible what we know because the journalist is going to have to translate it and use it to tell the public about what I was doing. If I turn around and talk to a colleague, we don't discuss what we know very much; we discuss what we don't know. And we argue about what we don't know and we fight about what we don't know. It's a totally different approach.[54]

But it is the subjective element in both communications that is problematic. Neither are adequately addressed by scientists or the media. How the media report on a subject is framed by their understanding. For scientists, this lack of understanding renders the whole process of explanation futile.

> If you get into all these details, you lose the reporter and what ends up in the paper is a real mess because he doesn't really manage to make heads or tails

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[54] Ibid. p.12.

> of it, so what you end up doing is trying to simplify things - you put forward the exciting facts and then you say, but, there are some uncertainties that yet have to be ironed out.[55]

Moser's research further indicates that there are two reasons journalists work the science beat: they are assigned, or they chose it. Moser found that journalists who were assigned the beat had little interest in it, and journalists who chose the beat were overly enthusiastic. In the first instance, journalists did not report on uncertainty because they didn't understand the issues. In the latter instance, journalists were so enthused that they downplayed uncertainty and only reported the positive.

When different experts come to different conclusions using the same data, the public is at a loss to know which result is the "truth". How scientific uncertainty is handled plays a major role in the level of public perceptions and acceptability. Krimsky and Plough state:

> By making scientific uncertainty explicit, communicators reinforce anxiety and reduce the public's confidence in science. On the other hand, if scientific uncertainty is presented as an unavoidable outcome of risk assessment, it can generate confidence in the honesty of the process. It may also build trust and diffuse the efforts of antagonists who play on the

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[55] Ibid. p. 13.

> weak links in the technical basis of a risk assessment.[56]

Concern regarding scientific uncertainty presents itself throughout the whole risk management process and one of the tasks of the risk communicator is to make sense of the uncertainty and present it in understandable terms.

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[56] Krimsky, Sheldon, and Alonzo, Plough. Environmental Hazards: Communicating Risks as a Social Process. Auburn House Publishing Company: United States. 1988. p. 30.

CHAPTER 3

Central Issues

Public Perception

As we have seen from the previous discussion, how the public perceive risk is a major factor in the risk management and disaster mitigation process. The various publics are often in conflict with each other and also in conflict with the expert. And yet, in order to successfully implement a risk management strategy and thereby ultimately reduce environmental health risks, full incorporation of the public's perception needs to be included in risk management decision models. Ongoing literature suggests that:

> The objective, quantitative nature of risk analysis, ... does not take into account how the public views risk. In contrast to risk analysis, risk perception is a process in which individuals subjectively or intuitively comprehend, estimate, and evaluate the probabilities and consequences of risk. As risk analysis fails to consider subjective elements in risk perception, it is important for decision makers to be aware of public concern for health risks in order that risk management decisions properly reflect such concern and ultimately receive public acceptance...[57]

Leiss suggests that "[i]n general, three main factors have been shown to influence perceived risk: the degree to which the hazard is understood, the degree to which it involves

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[57] Krewski, Somers & Birkwood 1987. in Leiss, p. 12.

feelings of dread, and the size of the population at risk".[58] Kishchuk[59] suggests that much of the empiri literature on public perception has "limited potential for applications" because it is not based on rigorous scientific method. Kishchuk further states that an understanding of public perception is important to a risk management model because ultimately, public perception is an influencing factor in public policy making[60].

Covello[61] identifies an extensive list of categories that factor into the public's perception of risk: catastrophic potential, familiarity, understanding, uncertainty, controllability, volition, effects on children, effects on future generations, victim identity, dread, trust and fairness, benefits, reversibility, personal stake, evidence,

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58 Ibid. p. 13.

59 Kishchuk, Natalie, A. 'Causes and Correlates of Risk Perception: A Comment', in Risk Abstracts; vol 4, #1. January 1987. p. 1-4.

60 Ibid. p. 1-4

61 Covello, Vincent, T. 'Informing People About Risks from Chemicals, Radiation, and Other Toxic Substances: A Review of Obstacles to Public Understanding and Effective Risk Communication' in Leiss, William. Ed. Prospects and Problems in Risk Communication. University of Waterloo Press; Ontario, Canada. 1988. p 5-8.

and origin. Kates and Kasperson[62] also suggest that the role of the media plays an important factor in shaping public perception of risks and hazards: in the last decade the media have consistently reported on the development and passing of hazard reducing legislation, and as well, have reported indepth on hazard causing situations, e.g., Chernobyl, Love Canal, Bhopal. It is this coverage that helps shape public perception of environmental health hazards. When we examine the case studies in the next Chapter we will see how perception and acceptability are further influenced by race, religion, and language - yet there is little research that addresses these aspects.

Acceptable Risk

Closely connected to perception is acceptability. The concept of acceptable risk is built on the notion that the public will tolerate some risks in order to obtain some benefits. Traditionally the public has been presented with risk comparisons to help individuals understand the degree of risk to which they will possibly be exposed. However, these risk comparisons have usually been ineffective because they have failed to make reasonable comparisons, or indeed,

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[62] Kates, Robert, W. & Jeanne X. Kasperson. 'Comparative Risk Analysis of Technological Hazards: A Review' in Risk Abstracts Vol, 1 #3. 1984.

to make "sense" of the comparisons offered, and therefore cloud the public's perception.

Covello points to the difficulties and limitations in risk comparison and develops a set of guidelines. He lists the important limitations as:

- Failing to emphasize uncertainties involved in the calculation of comparative risk estimates.
- Failing to consider the broad set of quantitative consequences that define and measure risk.
- Failing to consider the broad set of qualitative dimensions that underlie people's concerns about the acceptability of risk and technologies.
- Other limitations: legal constraints, alternative methods to that under consideration, social consequences, and quality of data.[63]

The guidelines he proposes to overcome these limitations are:

1. Target the comparison to a specific audience...
2. Be specific about the intent of the comparison and caution against unwarranted conclusions.
3. Explicitly acknowledge, disclose, and explain all assumptions and uncertainties in the calculation of risk estimates.
4. Systematically discuss and present, in separate analyses, risk estimates for the worst case, best case, and expected case.
5. Avoid comparisons that ignore distinctions that people consider important.
6. Focus the comparison on classes of substance, products, processes, or activities that are similar or related in their characteristics...
7. Formulate the comparison to address and illuminate all significant health, safety, or environmental consequences....
8. Provide information on consequences of decisions implied by the comparison, including social consequences.

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[63] Covello. 1988. p. 42-48.

9. Evaluate the effects of the risk comparison on people.[64]

To render technical information simple and provide a realistic set of comparisons Bernstein offers the following examples:

Parts Per Million :

1 drop of gasoline in a full-size car's tankful of gas
1 facial tissue in a stack taller than the Empire State Building.
1 pancake in a stack four miles high.

Parts per Billion:

1 sheet in a roll of toilet paper stretching from New York to London.
1 silver dollar in a roll of silver dollars stretching from Detroit to Salt Lake City.
1 four-inch hamburger in a chain of hamburgers circling the earth at the equator 2 1/2 times.

Parts per Trillion:

1 square foot of floor tile on a kitchen floor the size of Indiana.
1 second of time in 32,000 years.
1 drop of detergent in enough dish water to fill a string of railroad tank cars ten miles long.

Parts per Quadrillion:

1 human hair out of all the hair on all the heads of all the people in the world.
1 palm of one's hand resting on a table the size of the United States.
1 mile on a journey of 170 light years.[65]

By utilizing these types of comparative tables, the public can better grasp the magnitude of some of the specific risks individuals face.

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[64] Covello. 1988. p. 48. Emphasis mine.

[65] Bernstein, Alan, B. The Emergency Public Relations Manual. 3rd Edition. PASE Incorporated. No Date. p. 52.

Risk Communication

Risk communication has been recognized as a major component of the risk management process. In practical terms the objective of risk communication is to convert, or translate, "dense" scientific and technical information into terms that can be easily understood by the lay person. Although traditionally focused on health or environmental risk, risk communication is

> the act of conveying or transmitting information between interested parties about (a) levels of health or environmental risks; (b) the significance or meaning of health or environmental risks; or (c) decisions, actions, or policies aimed at managing or controlling health or environmental risks. [66]

In a series of papers presented at the National Conference on Risk Communication in 1986[67] the two biggest problem areas in the communication of risk were identified as (a) lack of understanding of technical information on the part of the public, and, (b) lack of trust and credibility of industry and government. Overshadowing or perhaps merging

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[66] Covello, Vincent, T. et al. 'Communicating Scientific Information about Health and Environmental Risks: Problems and Opportunities from a Social and Behavioral Perspective.' in Risk Communication Ed. The Conservation Foundation. 1987. p. 10.

[67] Ibid. An issue report based on the presentations and discussions.

with these two issues are the public's perception of risk and the public's levels of acceptability of risk.

Covello (1987) suggests that problems and concerns in risk communication fall into four categories: message, source, channel, and receiver.

Message problems relate to limitations in scientific knowledge that result in lack of information, and also, the inability of the public to understand and assess the technical information they receive. The limitations in scientific knowledge are typically expressed as difficulties of conducting risk assessments, converting laboratory and animal tests to actual situations, and problems in data gathering. What information is available is usually unintelligible to the lay person.[68] To counteract this, I concur with Leiss, that resources be made available to the public in order that this information can be rendered less formidable. This could include the provision of funds for the hiring of an "independent" third party expert, or, breaking down the complexity of the information in a series of public workshops and presentations. Both these points are covered in more detail later.

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[68] Ibid. p. 111.

Source problems include lack of trust and credibility in government and industry - often as a result of the "technical, bureaucratic and legalistic"[69] language presented to the public, lack of trust and credibility arising from expert disagreement (especially evidenced when the resources and support necessary to reduce the uncertainty is not available), and lack of input from the non-expert "interested parties".[70]

Channel problems fall into the domain of the media and include "selective or biased media reporting, premature disclosure of information, and oversimplifications, distortions, or inaccuracies in interpreting technical risk information".[71] Covello suggests there are various reasons for these problems. The media often tend to report the sensational news of injuries or deaths and spend little time covering "common" occurrences of injuries and deaths even if the numbers are considerable. He further suggests that the problem is institutional and not personal: journalists are usually subject to impossible deadlines, are not given enough time to conduct adequate research and few reporters

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[69] Leiss, William and Daniel Krewski. 'Risk Communication: Theory and Practice', in Leiss, William Eds. Prospects and Problems in Risk Communication. p.97.

[70] Ibid. p. 97.

[71] Ibid. p. 97.

are subject matter experts, therefore they have to rely on limited sources.[72] To counteract this, the media could be included as an integral component of the risk management strategy: by liaising with, and "courting" specific media personnel, feedback and support could reduce and eliminate distortions and inaccuracies. This is notwithstanding the problems in journalism identified earlier by Moser.

Receiver problems are in the public domain and include inaccurate perceptions of risk, overconfidence in the ability to deal with risk, refusal to accept scientific uncertainty and a reluctance to make trade-offs.[73] To better understand this we first need to have an idea of who the public are. Kasperson suggests there are six classifications of public:

> *The inactives* - citizens who engage in no political activity and who are also psychologically detached from politics.
>
> *The voting specialists* - citizens who limit their political activity to voting and who are unlikely to take sides in community conflict and issue extremity. Their activities are guided by national attachment to their political party.
>
> *The parochial participants* - citizens whose political participation is focused on the narrow problems of their own personal lives. They tend to have somewhat more information than the average citizen but have a low level of psychological involvement.

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[72] Covello in Leiss Ed. p. 19.

[73] Ibid. p. 111.

The communalists - citizens who are heavily involved in activity that is relatively non-conflictual and aimed at attainment of broad community goals. They tend to be above average in psychological involvement in politics, levels of information, and a sense of efficacy.

The campaign activists - citizens who are the opposite of the communalists - they have strong partisan affiliations, readily take sides in community conflict, and have relatively extreme issue positions.

The complete activists - citizens who are the mirror image of the inactives; they rate high on all participation orientations and are involved in conflict and cleavage but also have a sense of contribution to the community at large.[74]

Defining the public then is a complicated task for the risk communicator because it is unlikely that the risk communicator will ever be presented with one identifiable group. In most cases the risk communicator will be working with a combination of the last four classifications of public. It will be crucial to include these publics to achieve satisfactory completion of the tasks of the risk communicator. These tasks are:

1. Information and Education: Informing and educating people about risks and risk assessment in general. Example: Statistical comparisons of the risks of different energy-production technologies.

2. Behaviour Change and Protective Action: Encouraging personal risk-reduction behaviour. Example: Advertisements encouraging people to wear seat belts.

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[74] Kasperson, Roger, E. 'Six Propositions on Public Participation and Their Relevance for Risk Communication' in Risk Analysis Vol. 6. No. 3. 1986. p. 279.

3. Disaster Warnings and Emergency Information: Providing direction and behavioral guidance in disasters and emergencies. Example: Sirens indicating the accidental release of toxic gas from a chemical plant.

4. Joint Problem Solving and Conflict Resolution: Involving the public in risk-management decision making and in resolving health, safety, and environmental controversies. Example: Public meetings on a possible hazardous waste site.[75]

Health Protection Branch

At this point, it is worth spending some time to examine the HPB's risk communication strategy. Developed in part to address the limitations in the earlier models, this model is fraught with its own limitations. The Health Protection Branch have a well documented process for risk communication which proposes that risk communication is a two-way process between government and interested parties. "It calls for **public participation in the decision making process**[76] and, if successful, it should maximize public understanding about government risk decision making."[77]

While the method of communication is said to depend on the issue at hand, the methods of communication are:

Information Letters

Medical Device Alert

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[75] Covello, Vincent, T. Risk Communication. p. 113.

[76] Emphasis mine.

[77] Health and Welfare Canada. p. 57.

Surveillance

Canada Gazette Parts I and II

Annual Federal Regulatory Plan

Information Letters state the HPB's "position on an issue" and allow 60-90 days for public comment. Follow-up Information Letters are used to answer questions raised and to deliver the final position. While this method is "routinely used to provide public information on major regulatory proposals" the letters contain complex, scientific, and technical information and as such, the audience tends to be not the general public, but rather scientific experts.[78]

Medical Devices Alerts are also aimed at experts, this time specifically members of the health profession and others "aware of potentially hazardous medical devices". These alerts are used as an instructional tool; they inform users how to use these medical devices in a safe manner.[79]

Other types of information are issued to the health professionals via Surveillance, a publication used by the HPB.

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[78] Ibid. p. 57-58.

[79] Ibid. p. 58.

Another method employed for risk communication and public participation is the Canada Gazette. Part I contains the Regulatory Impact Analysis Statements and these statements contain an indepth discussion of the proposals. Part II contains the final regulation.

One of the major concerns this risk communication strategy reveals is the inaccessibility of these documents to the general public. More traditional methods of communication include the mass media but this avenue is also fraught with problems as I discussed earlier in this chapter. In particular, journalists are often unskilled in risk communication methods and therefore the appropriate information is frequently not conveyed.

The HPB obtains public participation in risk decision making by public involvement on advisory committees, public meetings, and via public opinion surveys. It is worth mention here that nowhere does the risk management model (discussed in Chapter 1) explicitly state that public involvement should occur at any specific stage. Indeed, it appears that the public actually has no defined role in decision making, rather, the public come into play when they are informed of the decisions made by the HPB.

Kasperson (1986) has found that the inclusion of the public through public hearings is often 'ineffective' and 'alienating'. The language is often technical; the proceedings are restrictive due to procedural rules; the attendees usually are not representative of the community; and the information gathered is of little value to the lead agency.[80] Further:

> ... public hearings, whatever their intent, tend to be used to satisfy minimal legal requirements and to solve agency goals, as by building support for agency plans and for diffusing existing or potential antagonism.[81]

In the next chapter I will examine the role of race, ethnicity, and language (the importance of which has not be recognized to date) in the risk communication debate. We saw from Covello's guidelines that there are specific factors that shape a person's perception and acceptability, however, Covello fails to address issues of race, ethnicity, and language yet they exist as clearly identifiable and quantifiable factors in the debate. We also saw that Kasperson suggests the role of the media is crucial in the debate, as well as an understanding of the different types of public. Yet, neither Covello nor Kasperson adequately

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[80] Kasperson (1986) p. 280.

[81] Ibid. p. 280.

establish the role of race, ethnicity, and language in the risk management and disaster mitigation process.

Kasperson's definitions of public also do not account for race, ethnicity, and language. In the case studies presented in the next chapter, I will show that specific communities monitor specific media as an information source, in fact, media that fall outside of the "acceptable" norm are considered unreliable. This has significant impact on the risk communication process. I will show that communication, perception, and acceptability are heavily impacted by race, ethnicity, and language, and that the existing disaster mitigation and risk management processes are not equipped to effectively deal with any of these factors.

CHAPTER 4

Race, Ethnicity, and Language as Factors affecting the Perception and Communication of Risk.

Some of the areas that have received little attention in the risk management/disaster preparedness and mitigation debate are the areas of race, ethnicity, and language. Yet a person's race, ethnicity, and language can have a major bearing on their risk perception and levels of acceptability - as well as the risk communication process. In this chapter I will review some case studies where environmental health risks have occurred as a result of natural disasters.

If we turn to bodies of literature in the social sciences, such as sociology, anthropology, and psychology, we can ascertain that the typical focus of study has been centred on kinship ties, communication paths, and dysfunctional behaviours within families. There is also an abundance of literature in the social sciences that relate to human behaviour/response in risk causing situations such as natural disasters. I will briefly examine the major literature in these areas and provide an historical overview.

Literature Review

Mileti, Drabek and Danzig suggest that when a community receives a disaster warning, community members attempt to confirm those that are warnings of "impending" disaster.[82] Drabek and Stephenson have observed that when warnings are received through the mass media, the public will resort to other means of confirmation,[83] and Clifford and Fritze suggest that warnings communicated person to person, as well as warnings that are consistent regardless of source, are more likely to be believed.[84]

In studies on "belief" factors, Anderson, Mileti, Drabek and Haas have identified that message factors, including source, content, number of messages, and visual evidence of disaster, are a set of determining elements[85] that shape behaviour. Other elements in this complex array of factors include the behaviour of others, previous exposure to

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82 BEADY, Charles, H., and Robert C Bolin. The Role of the Black Media in Disaster Reporting to the Black Community. University of Colorado, Institute of Behavioral Sciences, Natural Hazards Research and Applications Information Center, Working Paper No. 56. Boulder: Colorado. 1986. p. 10

83 Ibid. p.10

84 Ibid. p.10

85 Ibid. p.10

disasters, community identity and makeup, and, proximity to the disaster area.[86]

In studies of family response to disaster warnings, Galvin, Brommel, Meltzer, et al, suggest that the "immediate" family has a major effect on perception, over and above social definitions and the mass media affect. Indeed, "[p]erceptions and definitions of the situation (Meltzer et al, 1975) derive from communication processes within the family context."[87] Race and ethnicity also play a major role in how families interact and to what degree kinship ties effect social relations. The familial traditions effectively define the patterns of behaviour.

> The extensiveness of Kin relations and the strength and energy of the ties typically vary by class and ethnicity, with [B]lacks, Hispanics, and certain religious groups maintaining more active relationships than others (Lee, 1980 & Staples and Miranda, 1980). Kinship ties can effect a family's definition of a given situation, response to hazards, resource availability in times of need, and stress-managing capacities (Bolin and Bolton, 1983).[88]

Socio-economic levels, age, and ethnicity also effect the family's capacity to deal with stress. Individuals and families with high social status (measured by income), high

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[86] Ibid. p.10

[87] Ibid. p.7

[88] Ibid. p.8

levels of education and increasing age "have been found to exhibit fewer disaster-related disturbances".[89]

In the area of behavioral response, studies have shown:

* The closer you live to a disaster area, the more likely you are to evacuate.
* The elderly are less inclined to evacuate due to both infirmity and long term commitment on an emotional or economic level.
* Families prefer to evacuate as a unit, and also to return home as a unit as soon as possible, "often before it is safe to do so".[90]

As mentioned in my earlier chapters, the role of "perception" in disaster situations is a complex of interacting factors. It is difficult to separate the notions of individual from those of the immediate family unit and also the larger social group as a whole. A crucial element in the formation of perception in respect to disaster warnings is, of course, the nature of the actual warning. Stallings, Erickson, Scanlon, et al, have shown that the media "often" report inaccuracies during disasters, while other studies reveal the media either downplay, or exaggerate the true nature of the hazard.

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[89] Ibid. p.9

[90] Ibid. p. 11-12

Case Studies

I will now review some of the case studies that focus on ethnicity and the media in disaster related situations. In particular I will examine Bolton: Ethnic Community Structure and the Use of Disaster Assistance; Bolin and Bolton: Race, Religion and Ethnicity in Disaster Recovery; and Beady and Bolton: The Role of the Black Media in Disaster Reporting to the Black Community.

Whittier Narrows

On October 1st, 1987, an earthquake measuring 6.1 on the Richter Scale struck California. The town of Whittier, situated in an area known as Whittier Narrows, suffered extensive damage to parts of the downtown area. Residential homes and businesses in the Los Angeles area were also damaged. Perhaps though, the biggest damage was of a social nature and was concentrated in ethnic minority areas.

> Although Hispanics make up about 27% of the Los Angeles County population, disaster assistance agencies reported that over 90% of the persons applying for shelter assistance were hispanic, with the majority of them speaking no English.[91]

A large number of minority ethnic groups resided in the older buildings in the poor, low income areas of East and

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[91] Bolton, Patricia, A. 'Notes from Interviews: Ethnic Community Structure and the Use of Disaster Assistance'. Battelle Human Affairs Research Centre, Seattle, Washington. 1988. p.1

West Los Angeles. Hispanics, who form the largest ethnic group, tended to reside in the types of buildings that suffered the most structural damage, i.e., older, unreinforced masonry buildings. Approximately 900 low income residences were pronounced uninhabitable for safety reasons and this resulted in high numbers of Hispanics seeking disaster assistance.[92]

Although Bolton's methodology did not allow for comparison of behaviours between ethnic groups, her interviews with disaster victims and response agency personnel suggest that there was a "high level of anxiety about earthquakes apparent in the Hispanic neighbourhoods".[93] Bolton suggests this increased activity was directly related to the victim's previous exposure to devastating earthquakes prior to their arrival in the United States. She further suggests:

> The Hispanic victims did not assume the earthquake danger was over after the October 1st event. The subsequent major aftershock a few days later reinforced this fear. (Note: this was not so evident among Asian respondents, who in general had less experience with earthquakes, and know less about the California hazard.)[94] The Hispanic victims adapted to this concern by leaving their apartments and staying

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[92] Ibid. p. 2-3.

[93] Ibid. p. 4.

[94] It should be noted that while Bolton identifies Hispanics as a 'general' term to refer to persons from Latin America and Spain, there is no definition to describe the origins of the Asians.

> outside, in parking lots and parks near their buildings if possible.
>
> A decision to remain outside one's dwelling is partially an individual choice, partially social behaviour. Often cues are taken from the behaviour of others in situations of uncertainty.
>
> When most of the tenants from several apartment buildings camp in nearby parking lots and streets, this adaptation is highly visible (and troublesome) to others, compared to when suburban dwellers camp in their own individual yards.[95]

Other factors that serve to increase the levels of anxiety included the amnesty programme concurrently underway and also the fact that the disaster struck on the first day of the month. Bolton suggests that a high number of the Hispanic victims were "illegal" immigrants and had applied, or were in the process of applying for amnesty. The responsible authorities took up to two weeks after the earthquake struck to formulate a decision on who was eligible to apply for disaster assistance.

> One stipulation of the program was that the eligibility for the program could be compromised if the applicant received certain kinds of social services. It was not clear whether or not disaster assistance would jeopardize the eligibility of the applicant. It took many days for an official ruling to be made on this matter.[96]

The earthquake also struck on the first day of the month when rents were due. Many of the Hispanic victims were

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[95] Bolton. p. 4-5.

[96] Ibid. p. 8.

uncertain if their rent would be returned if the building was subsequently condemned, or, if they were to withhold their rent until this became clear, would they be faced with eviction for non-payment.[97] Given that approximately 900 low income residential units were removed from the housing market, the options for relocation were severely restricted.

Bolton states that television coverage aired immediately after the disaster often focused on the language difficulties experienced by both the victims and the response agencies. However, she gives the language issue only passing mention.

> The Red Cross had around 10,000 persons registered at the shelters at some point. Although a very small proportion of the population, this was a very large absolute number, which outstripped the Red Cross staffing and volunteer recruitment. It was confounded by the fact that at the Red Cross's estimate, over 90% and probably over 95%, of the shelter registrants were Hispanic, with the bulk of these not speaking enough English to negotiate the system. The Red Cross found that it needed far more bi-lingual shelter staff than it was prepared to find quickly.[98]

Language issues were also identified as creating problems in the building inspection unit. City inspectors and engineers had the task of examining hundreds of buildings to ascertain if they were safe in order that residents could return. The

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[97] Ibid. p. 5-8.

[98] Ibid. p.9.

City found it necessary to send out bilingual teams since the inspectors and engineers found themselves in the "front line" with the displaced residents. They were placed in the unusual position of having to explain to residents the meaning of signs posted, or, they had to try and convey to residents that they must vacate a building immediately. Eventually signs in Spanish were "specially prepared" but this created additional difficulties because the information differed to that on the pre-earthquake prepared English signs.

Bolton does not address questions arising from other ethnic groups perhaps because other ethnic groups did not make use of the Red Cross shelters. Bolton turns to "[s]ociological wisdom"[99] and suggests that Asians and other ethnic groups would have probably assumed that since the shelters were filled with Hispanics, they were indeed for Hispanics. She further states that should this interpretation be inaccurate, another possibility is that other (smaller) ethnic groups would have been uncomfortable in shelters that housed so many members of a different ethnic group.[100]

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[99] Ibid. p.9.

[100] Ibid. p. 9.

Paris, Texas

Bolin and Bolton[101] examine the impacts of a tornado that hit Paris, Texas on April 2nd, 1982. Eleven people were killed, 322 injured and the resulting damage left hundreds homeless. Unlike the previous study on Whittier Narrows, the effects of the tornado were suffered equally by Black and white communities. A total of 431 residents were interviewed, all having suffered a combination of loss of kin, loss of friends, severe damage, or homelessness. As well, numerous government, church, and private response agency personnel were interviewed.

In order to assess the effects of the tornado in Black and white households a comparison was made using a set group of variables: "household income, occupation and education of the head of the household, household size, household type, marital status of the respondent, and age of the respondent".[102] The results indicate that Black households had less socioeconomic support than white households after the disaster, but, they also had more socioeconomic responsibilities.

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[101] Bolin, Robert and Patricia Bolton. Race, Religion, and Ethnicity in Disaster Recovery. University of Colorado, Institute of Behavioral Science, Natural Hazards Research and Applications Information Center, Environment and Behaviour Monograph No. 42. Boulder, Colorado. 1986.

[102] Ibid. p. 28.

> There were statistically significant differences between racial groups on all of the characteristics examined except for age of the respondent. The socioeconomic variables -- income, occupation, and education -- all showed black victims doing significantly poorer than white victims. The family variables -- size, type, and marital status -- produced more complex results. The major differences in household size appeared to be in the categories of two-person households and households with five or more members; 37.7% of white households and 20.5% of black households contained two persons. Conversely, 10.4% of white households and 25.1% of black households had five or more members. In light of this finding, it was not surprising to find that the majority of white households did not have young children present (61.3%), while the majority of black households were "childrearing" (37.9%) or "extended" (14.6%). At the time of the tornado, more white victims were married than black victims, while more black victims were single, separated, or widowed.[103]

Other significant observations include:

* more white victims (37.7%) than Black (33.3%) had their homes "completely destroyed".

*	**$$ loss to homes**	**Black**	**White**
	<$5,000	36.5%	25.3%
	>$36,000	7%	15.7%
*	**Average loss**	12,600	17,500

* 132 respondents were renters - almost half the renters were Black[104] and the majority lived in government subsidized housing. Only 12.3% of the renters were white.[105]

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[103] Ibid. p.28-29.

[104] Actual figures not provided.

[105] Ibid. p. 30.

In this study Bolin and Bolton found the psychosocial differences between both racial groups to be minimal. Both groups experienced nervousness during the impending disaster time period. Both groups experienced post disaster sleep disorders, the difference (statistically insignificant) being that whites suffered sleep disorders associated with "several demographic factors" while Blacks' sleep disorders were related to the death and injury of "persons they knew".[106] Counselling was widely available to Blacks and whites equally, services being offered by government, church and private individuals. Although more whites than Blacks revealed they had suffered from emotional stress, there was no significant difference in the numbers attending counselling sessions between each racial group.[107]

Respondents were not asked questions relating to their use of the media in pre-disaster situations but they were asked where they had obtained information regarding the availability of disaster assistance. It was ascertained that a significantly higher number of Blacks received information by word of mouth and from the disaster aid centres themselves, while whites were significantly more likely to receive their information from the media.

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[106] Ibid. p. 40.

[107] Ibid. p. 43-44.

> About 30% of white families and 21% of black families received their information from television or radio. Similarly, about 52% of white families and 41.5% of black families reported reading about aid programs in the newspaper.[108]

Kauai, Hawaii

Hurricane Iwa spawned from a tropical storm that began on November 18th, 1982 at 2:00am. By the 24th November the hurricane had swept through the Hawaiian Islands leaving the island of Kauai severely damaged by winds and swell activity. The last hurricane to sweep the islands and cause any kind of substantial damage occurred in 1959. Other hurricanes have come close to the island but have veered off before any real and damaging contact was made.

Using statistics from the 1980 census, Bolton and Bolin provide the following figures on the ethnic breakdown of the Kauai population[109]:

Japanese	25%
Filipino	26%
Caucasian	29%
Hawaiian	15%

While most of the population can speak English, "about 29% of all the residents five years of age and older speak a

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[108] Ibid. p.53.

[109] Ibid. p. 143.

language other than English at home".[110] In addition eighty-one percent of the year-round accommodation is single family dwellings and "over one-half" of these are owner occupied.[111] Kauai was chosen for the study because of its ethnic diversity.

> The sample of victims was 33.2% Caucasian, 25.1% Japanese-descent, 19.7% Filipino descent, and 9% Hawaiian, with the remaining 16% being Chinese or those representing themselves as being of mixed ethnic backgrounds (mostly various combinations of Asians and Pacific Islanders). This distribution can be taken as representative of the distribution of damage by ethnic group for those districts sampled.[112]

Although a large population of the sample refused to divulge their monthly income, it was set by Bolton and Bolin, at $1,287 after tax. The income level was equivalent throughout all the ethnic groups. In the housing sphere, over 70% of the Japanese owned their own homes and had lived in the same dwelling for long periods of time, i.e. over 15 years. Over 50% of the Caucasians rented their dwellings and, as well, the Caucasians were the most transient group, having for the most part resided less than 5 years in their impact dwellings. The Filipinos were also long established residents of Kauai and although most had lived on the island

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110 Ibid. p.143.

111 Ibid. p. 143.

112 Ibid. p. 147.

for 20+ years, they were more transient than the Japanese and over 55% rented their dwellings.

The Filipinos were also the least educated group with 39.5% having an educational level of Grade 9 and below. The Caucasians were statistically the most highly educated, however, the Japanese were a very close second. For example, 33.1% Caucasians were high school graduates compared with 32.7% Japanese; 22.6% Caucasians were college graduates compared with 19.5% Japanese. Only 15.1% of the Filipinos were college graduates.[113]

Although loss of life and serious injury was not a factor in Kauai, property damage was severe and resulted in homelessness and dislocation for many.

> [T]he average level of structural damage to the individual dwelling of each respondent family was 32.8%. The average dollar loss reported by the respondents for structural damage was $21,489.... The average percentage loss to the contents of an individual dwelling was 24% on Kauai; the mean dollar loss to contents was $7,025. Kauai residents had the additional loss (typically in the $100 to $200 range) of perishables caused by the electricity having been off for at least a day or more.[114]

When assessing the levels of damage suffered by each ethnic group, differences are readily apparent. The Caucasians

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[113] Ibid. Appendix B. Table 12. p. 247.

[114] Ibid. p.150-151.

suffered the highest level of structural and content damage, but this seems to be directly related to their higher propensity to live in houses located on the beach. In the other two groups, the Filipinos were more likely to suffer more than 25% damage while the Japanese typically suffered losses less than 25%. This difference appears to reflect the quality of dwellings rather than the location.[115]

The design of the Kauai study, unlike the Paris, Texas study, did not allow for any examination of the psychological impact of the disaster on the victims. Also, since the study was conducted some 8 months after the hurricane struck the islands, there is some doubt (by the researchers) of the validity of some of the results. For example, while the majority of media reports covering the period of the disaster suggest that victims were suffering from psychological stress and trauma, this was not borne out by responses gathered 8 months later.[116]

If we examine the use made of disaster assistance centres(DAC) we can again ascertain different levels of usage by the three ethnic groups. The Japanese used the DAC's the least, and those that did attend centres were less likely to return after the first visit. Bolton and Bolin

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[115] Ibid. p. 151.

[116] Ibid. p. 151-153.

are unable to discover the reasons for this pattern of activity and are left to speculate that

> the difference is believed to reflect a choice on their part, perhaps deriving from cultural influences on attitudes toward the need for, and the appropriateness of, seeking outside assistance.[117]

Of the other two groups, the Caucasians, who suffered the most severe damage and losses, tended to visit the Federal Emergency Management Agency DAC's, while the Filipinos primarily visited the Red Cross and the Salvation Army. The Japanese made greater use of short term government loans than did the Caucasians and Filipinos. The Japanese were also the only ethnic group to have substantial, if not sufficient, insurance coverage for their losses.[118] While Bolton and Bolin suggest that this evidence illustrates why the Japanese would be less likely to require aid from DAC's, unfortunately, their design methodology does not allow for this "anomaly" to be more meaningfully addressed.[119]

British Columbia

Having examined the above case studies I will now present a view of the cultural and language mix of British Columbia. I

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[117] Ibid. p. 162.

[118] Ibid. p. 162-171.

[119] Ibid. p. 170-171.

will show that the population is very mixed and diverse and needs special consideration in the area of risk communication and education. The total population of British Columbia (1986 Census data) is 2,849,585 - equally divided between males and females. Of this total, approximately 42,000 residents speak neither official language. During the 1986 Census[120], data gathered regarding the total population speaking French and English revealed:

Total Population	2,849.585
English only	2,630,060
French only	1,335
English and French	176,185
Neither	42,005

A further breakdown of the 42,000 follows. The table on the left reflects the population by selected home language, (the language spoken predominantly in the home) while the table on the right reflects the number of that total who speak neither official language.

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[120] Statistics Canada. Total Population by official language for British Columbia. 1986 Census. Data from the 1991 Census was unavailable at the time of writing.

Home Language		None French/English Speaking
Cree	175	10
Micmac	5	0
Montagnais-Naskapi	5	5
Inuktitut	10	0
Italian	11,155	1,395
Romanian	185	10
Portuguese	5,825	965
Spanish	3,705	870
German	14,890	835
Yiddish	25	10
Dutch	2,575	130
Flemish	55	0
Swedish	430	15
Danish	525	5
Norwegian	385	10
Ukrainian	1,560	190
Russian	2,155	310
Croatian	2,090	130
Serbian	145	20
Serbo-Croatian	190	20
Slovenian	50	0
Czeck	2,010	160
Slovak	340	0
Polish	3,095	310
Latvian	160	10
Lithuanian	180	10
Finnish	2,745	450
Estonian	495	20
Hungarian	2,300	235
Greek	2,445	240
Armerian	300	75
Arabic	530	75
Hebrew	95	0
Maltese	40	0
Persian (Farsi)	1,695	230
Hindi	2,920	490
Punjabi	26,970	6,775
Urdu	590	70
Japanese	4,150	865
Korean	2,660	575
Chinese	69,845	21,515
Thai	745	160
Khmer (Cambodian)	425	290
Vietnamese	4,300	1,095
Tagalog (Filipino)	3,670	205
Creoles	30	0
Other Languages	8,434	1,005

Enquiries at the British Columbia Provincial Emergency Program reveal that emergency preparedness information (including environmental health risk information) is typically available in English only. In 1992, a group of business, industry and government individuals involved in the emergency planning sphere developed a pamphlet "Prepare now for an earthquake in British Columbia".[121] The City of Vancouver has recently published this emergency preparedness pamphlet in French, Chinese, Punjabi, Vietnamese, and Spanish. However, it can be seen from the data above that this does not cover all the language groups.

The pamphlet was produced in these languages on the advice of Vancouver City's Health Department, who in turn target these specific groups when producing health risk information. However, there is no systematic programme existing in government agencies in BC that ensures specific communities are targeted. Further research would need to be conducted to establish the locations of the target groups and then, given the structure of the existing risk management models, there is no guarantee that the expert view and the target population's view of the risks (if any) likely to occur will tally.

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[121] This pamphlet was produced and financed by a Lower Mainland business and industry and government group. Production costs came from the private sector.

In the examination of the risk management models presented earlier, and in the later review of the case studies I have shown that the existing models cannot address the complexities brought to bear by race, ethnicity, and language. In the next chapter I propose a new risk management model, a model that has a clear proactive element and includes risk communication not just at the decision stage, but from a pre-identified stage. I will first present the model and then describe the individual elements in detail.

CHAPTER 5

Proactive Risk Management

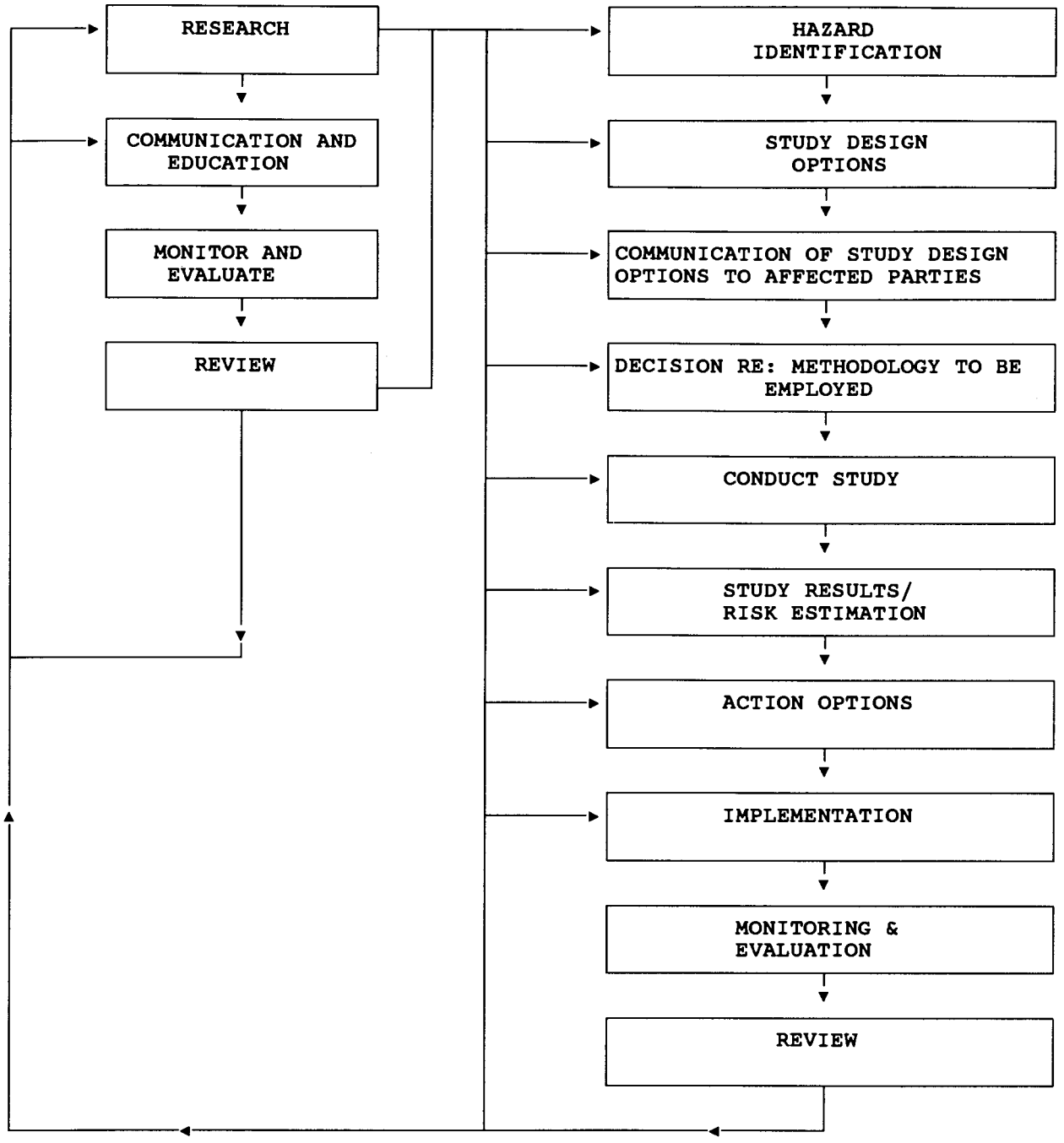

Figure 3

The models that we examined in Chapter 1 are primarily reactive risk management processes. The Health Protection Branch is the exception because under its risk management model there is a specific category for education. However, this education is typically in response to "global" or "common" health risks such as the dangers from UV rays. In the model proposed here I have included a specific proactive field, a field that further builds on Leiss' modifications discussed earlier. The framework is set out in Figure 3.

By formulating a proactive factor into the risk management plan, I am attempting to create a situation whereby, with the utilization of appropriate research and education, the public will have prior knowledge and education regarding issues that could produce any kind of health or environmental risks. Let us now examine each of the factors in the process.

Research

In order for a proactive strategy to be successful, the first and perhaps most important factor is the establishment of issues and concerns. Those agencies having a mandate that includes some element of protecting the health and safety of the public should be the prime movers. This would include the HPB, Ministry of Health, Provincial Emergency Program, Emergency Preparedness Canada, Agriculture Canada and the like. In this category, the risk managers of the

various agencies would conduct ongoing research of current risk studies literature (academic, professional, government, etc.) in order that the most up-to-date information is garnered on the recent issues and concerns of a myriad of topics. Ongoing discussion would be conducted between the risk management personnel and:

- their peers (specifically other risk management personnel in Canada, North America and Europe);
- the public (both individual citizens, special focus organizations and community groups);
- special interest groups (such as groups for the chemically sensitive);
- business and industry environmental health spokespeople.

Risk communication plays a central role in this model because it is at this initial stage that risk communication already comes into play. It is crucial that the concerns of the public(s) are considered when identifying the issues and concerns. As I have pointed out in previous chapters, since the experts and the public often disagree as to the risk factor, even scientifically unsubstantiated concerns should be addressed with the same vigour as the scientifically validated. Unless the public can see that their concerns are being addressed, any strategy to deal with the experts' concern will be problematic.

During this research process, evidence of a critical situation may be revealed. At this initial stage, this model allows for the shift from the proactive sphere to the reactive sphere if the conditions prove necessary, e.g., the discovery that a particular softball field is built above a toxic waste dump. Otherwise, the next step in this process is the communication and education sphere.

Communication/Education

Having identified the issues and concerns the next step is to implement an education programme both within the appropriate agency or agencies and the public. Any endeavours that are intended to communicate and educate will only be effective if two-way communication channels exist. Bearing in mind my earlier discussion on risk communication, attention should be paid to the following:

Is the source of information credible?

Is the message clear and/or appropriate?

Is the audience receiving the intended message or some other, unintended, message?

Is the communication medium appropriate?

Since effective risk management techniques are important to expedite effective risk management strategies, agencies which are responsible for minimizing environmental health risks should be involved in this process and be presented

with the complete information gathered in the first step. As well, they should be instructed in methods designed to facilitate the most effective risk management strategy possible. This instruction could be in the form of conferences, training programmes, workshops, information packages, and presentations by expert speakers and representatives from "interested parties". This should ensure that only trained communicators are working face to face with the public. As these personnel become conversant with the issues and strategies, they in turn will then conduct similar education sessions with members of the public, special interest groups, and community groups. As well, additional methods such as displays at local health centres, shopping malls, community halls, libraries, etc, could be employed. The focus of these sessions is twofold: to present the necessary risk reduction education and information to the public and, to ensure that if and when the concerns of the public change, the communication and education strategy is equipped to deal with that change. Of importance is the need to educate how individual practices generate risk. I argue that an adequate risk education strategy placed at this level in the risk process, and aimed at both industry and the public, could reduce the requirement for implementation of many reactive risk management strategies. This effectively flips the process from one of risk management to one of disaster mitigation -

the difference is reducing the risk as opposed to managing the risk.

Monitor and Evaluate

The risk reduction strategies adopted should be under continual monitoring and evaluation. This process will include all the groups and agencies that were part of the above two spheres.

Review

It is necessary to ascertain if the adopted strategy has, or is in the process of achieving, the preferred objectives. This would be revealed by a change in awareness of the health risk issues, and/or result in the production of desired behaviour or perception changes. If the expected changes are not occurring, a review of the previous steps may be necessary. In this case, it could be that the original research needs revisiting or the communication and education strategy needs to be reassessed. If the situation warrants, i.e., if there is no movement toward the desired awareness and behaviour changes, it may be necessary to move to the reactive model in order to alleviate a "critical" situation at some later date.

Reactive Model

Hazard Identification

For the reactive model we again include the public and other interested parties at the earliest activity. In order to identify if a hazard exists various studies are undertaken: case reports; epidemiological studies; toxicological studies. In addition the public's perception of a hazard is also crucial, even when the hazard is not perceived by the experts. To ascertain the public's perception the public must be involved in the hazard identification. Media reports may prove useful to identify some public issues and concerns. This model also includes subjective elements in the hazard identification stage. It is perhaps the only model of its kind that proposes this placing; other models tend to consider public perception to be an issue of concern in the option analysis or risk management stages.

Study Design Options

Once the presence of a hazard has been established the next step is to develop the methodology used to actually investigate the hazard. At this stage no decision is made, only the methodology options are presented; what methods are going to be used to obtain results.

Communication of Design Options to Affected Parties

In this sphere a detailed report outlining all the methodology options is prepared and distributed to all the affected parties. Discussion should take place with all the affected parties and public hearings should be held. This study is intended to reduce criticism surrounding the methodology not being appropriate to address the concerns in question.

Decision Re: Methodology to be Employed

This decision is made by all the affected parties. As with the other spheres in this model two of the main questions to be addressed is who has the ultimate responsibility to make the final call, and, who will provide the funds to the affected parties to hire third-party experts to assist in their deliberations.

Conduct Study

In this sphere a study is conducted utilizing the chosen methods to conduct the **risk estimation and evaluation.** As with the earlier models the issue here is uncertainty.

Study Results

The next step is to prepare a detailed report of all the study results including all the technical information and any other documentation utilized. The report should be

comprehensible to all the affected parties and should detail the estimated risk to the given population.

Action Options

Here another report is prepared, distributed, and discussed with all affected parties. This report should provide details of all the action options and all the alternatives. Some of the issues that need to be considered include what are the most "appropriate" actions and by whose estimation: who pays for what: who has ultimate responsibility: how are the actions enforced and/or regulated.

Implementation

The methodology is then implemented.

Monitoring and Evaluation

At this stage a detailed report of the results to date is prepared and distributed and discussions held with all the affected parties at public meetings.

Review

Based on the information garnered from the monitoring and evaluation stage, this step allows for the any of the other steps to be revisited. This includes going back to the hazard identification step or, if practicable, a move over

to the proactive sphere in order that an ongoing education and information process is ongoing.

Conclusion

If we revisit the aims of the IDNDR detailed on page 2, it becomes evident that the existing risk management models are not adequate to meet these aims. The existing risk management models are based on scientific analysis of laboratory and toxicological studies. The public is largely excluded from the process of risk management, and, in those instances where they are given participatory status, their level of participation is limited by the role that has been pre-defined. In nearly every case, the public are brought into the risk management process after "experts" have decided the nature of the risk and the risk management decision. This whole process is framed in an expert vs. lay person debate, with the laypublic being provided few resources to better understand the expert position.

The communication of the risk management strategy is also in the hands of the experts, albeit in this instance, the public policy expert. How the public perceive risk, and to what levels they find the risk acceptable, is therefore framed outside of their field of reference. While these models have been adequate for a public reliant on a

paternalistic government, in the last two decades, the North American public have become of age: they are taking control of their own lives and living conditions and demanding an active and interactive part in any process that effects those conditions. The old style risk management models are therefore outdated. They cannot accommodate an educated and willing public.

The model proposed here attempts to rectify the limitations of the earlier models by expanding the process to allow the public full participatory status, even to the extent of defining if a hazard actually exists. In this sense, race, ethnicity, and language issues will be assimilated into the process because the effects these factors may produce on the process become subsumed in the process itself. By including media reviews, literature reviews and public perception in the process I suggests they play an equal role in establishing the identity of hazards.

The pro-active aspect to the model and the loop that that process allows, ensures that risk management and disaster mitigation practices are dynamic. Even in those instances where a strategy is found to be successful, it should not be assumed that the task is complete. The research, communication, and education must be continual. Inherent in this model is the ability to move back and forth from the

pro-active to the re-active strategy whenever circumstances dictate. This model ensures a continuing and ongoing process.

In addition to the points discussed in this chapter wherein I outline how the model incorporates the public in the risk management process, there is a need to research these issues further. I propose that the following aspects be areas of focus:

The role of the media. Beady and Bolton identify that the Black respondents in their study relied heavily on word of mouth for information regarding disaster assistance, while the white respondents were more likely to receive their information from the media. It would be important to ask why the Black and white respondents relied on these information sources and, in addition, what information sources other cultural groups rely on. Did Blacks rely on other Blacks for their "word of mouth" information, or, would it make a difference to levels of acceptability if the "word of mouth" information came from someone who is white, hispanic, asian, etc. Does the class background of the source have an effect on a person's level of acceptability of a message and, if so, what is the significance of this? Knowing this information could provide insights into the most appropriate source and medium to use in conveying information to specific cultural groups.

Another area that needs further study is **the inclusion of the public in the risk management process.** This is a significant area of research, not just for members of ethnic minorities, but for all members of the general public. One of the hardest tasks that risk managers have, is finding effective methods to include members of the public (specifically, members of the public who may be affected by a particular risk) in the risk management process. One of the simplest, and perhaps initial steps, should be the development of close ties with the representative members of clearly defined groups. Here I am referring to people such as leaders of ethnic minority groups, church leaders, neighbourhood community group leaders, representatives of special interest groups, parents associations, etc. Building bridges should be a key theme in the initial contact. Building trust and developing credibility takes time and is better performed prior to the onset of a specific risk being identified.

Other methods of including members of the public could be for lead agencies to solicit members of the public to become involved in specific community issues. As an example, the Provincial Emergency Program (PEP) could use print, tv, and radio information bulletins to solicit interested members of the public to form community based committees to address risk issues in their immediate community. It would be

important to note if the public's view of risk in their community tallies with the expert view - maybe it would be discovered that the public are concerned with youth gangs and the experts are concerned with the transportation of dangerous goods in the area. This would have a significant impact on the effectiveness of a risk communication strategy put in place to deal with dangerous goods issues. At this point, any research into the area of public involvement would greatly enhance the information already available. I believe as risk managers, sometimes we forget the simplest course of action is often the most expedient - just ask what people want. Too often the public are not asked for input because it is felt that they don't understand the issues, or they would otherwise hinder the process.

In any event, it is clear that the public must be included in the process for, without a relative degree of correspondence existing between the public perception of risk and the expert perception of risk, the process of risk management and disaster mitigation, particularly in relation to the identification of hazards and the communication of risk, will be fraught with problems.

This thesis is but a small part of the ongoing debate on risk management and disaster mitigation.

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