Risk Management: Why and When Decisions Fail

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> We have had and continue to have serious outbreaks of waterborne disease in affluent nations.... [T]hese outbreaks were preventable.... Safe drinking water is one of our best bargains.[1]

Abstract

Over the past thirty years governments and industry have created a paradigm for health and environmental risk management that is now widely accepted. This paradigm is incorporated into regulatory decision making as well as into standards and codes. It is designed to assist risk managers in reaching a threshold of "acceptable risk" (however defined) in all types of challenges, both in everyday routines and in crisis situations. And yet, all too often, the system breaks down, often in the most elementary ways. This paper examines some of the reasons for these breakdowns; one overriding cause of failure, it argues, is in a failure to cut through complexity and focus on the "bottom line" – namely, the demand for continuous improvement in risk mitigation. This demand applies in all cases, even where attained organizational performance in risk management is at a very high level, because the strict focus on this goal at all times is the best guarantee against the subtle accumulation of seemingly trivial lapses that can accumulate and be transformed into catastrophic but preventable events.

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[1] S. E. Hrudey & E. J. Hrudey, *Safe Drinking Water: Lessons from Recent Outbreaks in Affluent Nations* (London: IWA Publishing, 2004), pp. 3, xvii.

Overview.

Decision making in the areas of health and environmental risks has become effectively standardized, in industrialized nations over the course of the last forty years or so, with the use of a risk management [RM] approach. The institutionalization of RM in regulatory practice, and its expression in explicit, detailed, step-by-step manuals of procedure, means that there is no excuse for managers who fail to discharge their responsibilities in this regard. And yet high-profile failures abound, often with truly disastrous and avoidable consequences. There are of course many reasons for these failures. This paper will concentrate on explicating the following types of failures:

- *Type 1: Decisions fail because many practitioners – who deal with multiple risk factors – do not use a simple risk ranking matrix to allocate time and resources to priority areas of concern.*
- *Type 2: Decisions fail because practitioners have not been taught to look for the bottom line in risk management: the daily delivery of incremental improvements in risk reduction and risk mitigation.*
- *Type 3: Decisions fail because practitioners do not realize that true public engagement in the work of risk management is a necessity, rather than something to be avoided or provided for in cursory fashion.*

A clear recognition of the seriousness of these types of failures and the severity of their potential consequences, and the development of a willingness within an organization to confront and overcome them, are the difficult steps. Actually taking the actions needed to surmount them is the easy part.

The Risk Management Paradigm.

The "conventional paradigm" for health and environmental risk management in a regulatory setting evolved in Western nations over the preceding forty years. This was a linear, step-wise process having the following components, among others:

- Hazard characterization,
- Exposure assessment,
- Risk characterization and estimation,
- Management Options Analysis,
- Risk Management decision,
- [Risk Communication].

Typically, this procedure separated risk assessment from risk management: The former was regarded as a strictly scientific and technical procedure (the first three steps in the list above), whereas the latter (the last three steps) incorporates social, economic, political, and policy considerations.[2] The last step is put in brackets, both because it was often an afterthought and in any case was either left undone or done poorly.

Over the course of the past forty years governments and industry gradually became committed to this approach, and both accepted its application in a wide range of formal regulatory settings and for a broad range of risks – chemicals, radioactive substances, food- and water-borne pathogens, environmental contaminants, and so forth. Other publications from the U. S. National Research Council, especially *Science and Judgment in Risk Assessment* (1994) and *Understanding Risk: Informing Decisions in a Democratic Society* (1996), refined the underlying rationale and methods

[2] The classic statement for this conception is the so-called "red book" (named after its cover): U. S., National Research Council, *Risk Assessment in the Federal Government: Managing the Process*, 1983.

for risk management decision making. The concepts, methods, and quantitative techniques are well-established; they are summarized in many manuals of procedure as well as in international standards.[3]

The risk management approach has enormous advantages – for the public as well as for the institutions of business and governments – in economic, social, health, and policy dimensions. In essence, what RM allows us to do – when it is done well – is to manage our exposures to hazardous substances in a way that is both "acceptably safe" and cost-effective at the same time. And since everything we encounter is hazardous at some dose, this is a proposition with very broad application indeed. But it is not an unproblematic proposition.

Managing risk cost-effectively means to find the least-cost mechanisms for reducing risk to the level that is acceptable, and putting control measures in place to achieve this goal that are reliable. There are, to be sure, difficult challenges in actually carrying out this mandate, but the mandate itself is unproblematic. The problematic character of the proposition given above lies in its other dimension: The level where "acceptably safe" is set is always potentially controversial, by its very nature – which means that the element of controversy has to be recognized and "managed."

The most important reasons why this is so are: first, since our knowledge about risk changes over time, expert determination of acceptable risk also will vary, usually in

[3] See, for example, Australia/New Zealand Standard 4360: http://www.riskmanagement.com.au/

the direction of lowering allowable exposures.[4] Second, as society changes, new values will change public attitudes towards acceptable risk, especially for infants and children. Third, well-publicized incidents of harm (such as Walkerton) will also strongly affect the regulatory environment in specific areas.

The Three Key Failures.

We know how to execute risk management decision making – and yet all too often we fail at it, and fail egregiously. For in so many high-profile cases, the well-known procedures mentioned above are simply ignored! Examples abound:

- BSE in Canada (2003): The probability of BSE was quantitatively estimated, but the consequences were not (no agency in Canada is responsible for doing this). The result was a disaster waiting to happen.
- Walkerton, Ontario (2000): The most elementary rule of precautionary action in drinking water protection – maintaining the chlorine residual – was violated;
- Hurricane Katrina (New Orleans, 2005): The scenario exercises predicted, well in advance, the catastrophic failure of the levees at Category 3 levels;

Many of these high-profile cases, of course, involve multiple types of failures in good risk management. In the discussion that follows, the three types of failure singled out in this paper are presented as "ideal types," with illustrations.

Type 1 Failure: Ignoring Priority-setting.

[4] There is an abundance of such cases: For example, what are considered to be "safe" or acceptable levels of exposure to radiation (such as X-rays), lead (especially for infants), and fetal exposure to alcohol have been steadily reduced over many decades as a result of newer risk assessments.

The underlying objective of risk management is to (1) *anticipate* potential threats to health and to (2) *implement proactive mitigation measures* to reduce [sometimes: eliminate] their consequences. In order to be able to realize these goals, it is also necessary to (3) *study past events* and draw the appropriate lessons from them.

The *anticipation of harm* is carried out by means of a formal risk assessment, which comprises both a frequency estimation and a consequences estimation. The procedure is summarized in the formula R = P x C [risk is equal to probability times consequences]. The overall result is conveniently displayed in a risk matrix.[5]

For all organizations which manage multiple risks, it is imperative to (a) have a complete and up-to-date list of those risks, in a document shared with all risk managers; (b) complete a risk ranking matrix, updated as required, which is the basis for assigning priorities and allocating budgets.[6]

[5] It must be emphasized here that all risk management inputs are matters of *judgment*. There should be no "fetishism of numbers" in assigning cases to risk classes. An important part of any risk ranking exercise is the demand that the results should conform to the intuitive "gut feelings" of the professional risk managers. For astute comments on this theme see Richard Walker, "Risk management – the realities of implementation," paper prepared for AwwaRF Project "Risk analysis strategies for better and more credible decision making," Banff Conference Centre, April 6-8, 2005.

[6] The first major exploration of issues in a risk-based ranking of environmental protection priorities was *Worst Things First?* ed. A. N. Finkel and D. Golding (Washington, DC: Resources for the Future, 1994). As of 2005, many provincial governments in Canada are undertaking programs in risk-based priority-setting for environmental risks.

Risk Ranking Matrix

Consequence / Frequency	Catastrophic	Critical	Marginal	Negligible
Frequent	I	I	I	II
Probable	I	I	II	III
Occasional	I	II	III	III
Remote	II	III	III	IV
Improbable	III	III	IV	IV
Incredible	IV	IV	IV	IV

Notes:

1. For the descriptors in columns and rows, either qualitative or quantitative terms may be used. Or there may be a correlation chart between the two: For example, one could specify that "frequent" is equivalent to 1×10^{-2} (or 1×10^{-3}).

2. The Roman numerals indicate "risk classes" of *decreasing* severity.

The risk assessment will show the potential scope of the problem, both in terms of human and animal casualties and of economic losses; often these are shown in a series of different outcomes scenarios. Then both risk control and risk mitigation measures may be sought, the scope of which will depend on costs and budgets. Some end-point is specified, such as ALARA ("as low as reasonably achievable"). "Residual risk" is what remains.

The risk management resources of the entire organization should be concentrated on the goal of setting priorities for risk mitigation actions. This means that all of the risks which are the organization's responsibility should be arrayed in a single document. Second, a continuously-updated risk ranking exercise should be performed, the output of which is to allocate resources and attention in appropriate proportions. Where quantitative estimates are not available, qualitative ones will do.[7] The main point here is, for all organizations managing multiple types of risks, a set of completed risk assessments – however imperfect or rife with uncertainties they may be – is the necessary precondition for carrying out the risk ranking exercise. And it is only this exercise which tells the organization (1) what the priority areas for risk reduction are, and thus (2) how to allocate its resources efficiently and effectively for maximum impact.[8]

The case of BSE in Canada is instructive in this regard. In 1996 the U.K. government acknowledged that BSE was a risk to human health. At that time it was also generally conceded that the disease spread through recycling – in cattle feed – rendered animal parts infected with the disease agent. By 1997 Canada and other countries with large cattle herds and beef export markets began adopting new risk control measures. The estimate of potential harm requires a risk assessment, but Canada did not complete

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[7] *Note on resources:* The most technically-demanding aspects of RM are the frequency estimations and other aspects of quantitative risk assessments. In many cases these exercises can and should be contracted out to qualified external professionals. The organization's own resources should be concentrated on the risk management and risk mitigation dimensions (as well as risk policy issues).

[8] Seeking greater efficiency and effectiveness in regulatory settings for environmental protection is the objective of the initiative known as "smart regulation." See W. Leiss, "Smart Regulation and Risk Management" (2003): http://www.pco-bcp.gc.ca/smartreg-regint/en/06/01/su-06.pdf and, generally, the Government of Canada website: http://www.pco-bcp.gc.ca/smartreg-regint/en/index.html .

the first phase (the frequency estimation) until December 2002 – six years after the U.K. announcement, and a scant five months before our first indigenous case appeared. The tardiness in completing this technical exercise, which is only the first major step in the entire process, meant that insufficient time remained – before the catastrophe struck – to complete the process, to draw up the risk mitigation measures, and to seek to enlist external stakeholder buy-in of the measures that might have been recommended.

The second phase (consequences estimation) was never undertaken. The Canadian Food Inspection Agency, which carried out the first phase, has stated publicly that it has no responsibility to undertake the second phase. The bottom line is, therefore, for BSE and other zoonotic diseases, there is no agency in Canada which has the responsibility to complete a risk assessment. And without a risk assessment, no risk management measures – specifically, no risk reduction and mitigation measures – can be designed or implemented. This is, in my view, a most serious matter – because the four sick cows have cost the Canadian economy $8 billion to date (and still rising), as well as untold personal and family tragedies among Canada's farm community.[9]

The nature and consequences of the risk were known, on the basis of a qualitative and semi-quantitative analysis, as of May 1994:[10]

- "The probability of entry of BSE infected cattle through the 1982-89 importation of 183 cattle from the U.K. appears to be very high";

[9] See W. Leiss & D. Powell, *Mad Cows and Mother's Milk: The Perils of Poor Risk Communication* (Montreal: McGill-Queen's University Press), 2nd edn. (2004), pp. 229-61.

[10] Canada, Animal, Plant and Food Risk Analysis Network [APFRAN], "Risk Assessment on Past Importations of Cattle from France, Switzerland and the U.K.," Ottawa, May 1994, p. 11.

- Probable consequences include a trade embargo against Canadian beef, high costs for eradication and herd depopulation, "considerable" drop in domestic consumption of beef and dairy products, etc.

As mentioned earlier, the full quantitative frequency estimation did not appear until the end of 2002 – almost eight years later. The quantitative consequences assessment was never done. On account of the unnecessary and unconscionable delays in completing the risk assessment for BSE in the Canadian herd, the Government of Canada lost the opportunity to see clearly, well in advance of the impending disaster, the catastrophic nature of this risk. Thus it lost any opportunity to take the needed preventive and proactive – more precisely, the appropriately precautionary – actions.

Type 2 Failure: Missing the Bottom Line.

All too often the serious work in RM ends either with the frequency estimation (as in the case of BSE in Canada) or with a completed risk assessment – which means that the whole exercise is pointless. There is no point in starting out on the RM path unless one perseveres to the point where the public benefit may be obtained. This benefit is contained in the cost-benefit analysis of risk reduction opportunities and in the exploration of the feasibility of proactive risk mitigation measures. Every RM exercise should be carried forward to these two end-points.

A hypothesis that cannot be proved, strictly speaking, but one that is supported by much evidence, is this: Decisions in a risk management context – and disproportionately, the ones that have the most severe consequences – fail for the most trivial of reasons. This hypothesis is, of course, a variant of the thesis made famous by Charles Perrow in his

book, *Normal Accidents*.[11] Waterborne disease outbreaks around the world provide the best evidence in support of this hypothesis – in part because they have been so intensively studied.

According to the report of the Commissioner for the inquiry into the North Battleford, Saskatchewan episode in April 2001, which was occasioned by an outbreak of *Cryptosporidium parvum*, the city had no manual for the operation of its water treatment plants. No manual whatsoever. Period. Moreover, the group of senior city management personnel testified that *none* of them had any idea how the foreman of the plants department was carrying out his responsibilities. Furthermore, the city managers simply ignored requests from the provincial government department to have a performance evaluation done on its surface water treatment plant after a coliform event in 2000. The Commissioner concluded:

> There was a systematic failure on the part of the City of North Battleford to recognize its responsibility to produce safe drinking water. This failure was brought about by the City's collective lack of knowledge about what it takes to produce safe drinking water, and policies that discouraged the possibility it might acquire such knowledge.[12]

The failure in North Battleford was not the result of a safety system defeated by a set of complex and mysterious challenges. The failure was that of a managerial system marked by incompetence and ignorance of the most elementary kind.

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[11] Princeton University Press, 1999 (originally published in 1984).

[12] Robert D. Laing, Commissioner, "Report of the Commission of Inquiry into matters relating to the safety of the public drinking water in the City of North Battleford, Saskatchewan," March 28, 2002: Part 6, pp. 196-8: http://www.northbattlefordwaterinquiry.ca/final/pdfdocs.html

About a year earlier (May 2000) another outbreak – in this case, of the pathogens *Escherichia coli* O157:H7 and *Campylobacter jejuni* – in the town of Walkerton, Ontario had left seven dead and over 2,300 ill, including many burdened with the prospect of lifelong disabilities. A list of the most egregious failures in this case would include:[13]

- knowledge by the provincial regulator *beginning in 1978* that a well through which the pathogens reached drinking water was vulnerable to surface water contamination – and yet no special operating conditions were ever imposed;

- failure by the operator to monitor turbidity and maintain the chlorine residual (which would have prevented the tragedy);

- deliberate concealment of the possible contamination by the operator (so that a boil water advisory was not issued until 10 days later), preventing other health authorities from being able to take earlier action that would have reduced the consequences of the contamination.

A unique aspect of the fallout from this case was the ability of inquiry leader Justice Dennis O'Connor to examine under oath both officials and political leaders in the province of Ontario – and, in this way, to determine what role politically-driven policy choices may have played in bringing about this tragedy.[14] Over the course of the previous decade, the Ontario Ministry of Environment's budget had been halved and its personnel reduced by 40%.[15] This ministry was, among other responsibilities, the regulator for drinking water safety. The former premier of the province, Mike Harris, who had presided over the last stages of this *reductio ad absurdum* exercise, commented as follows during cross-examination on the witness stand:

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[13] S. E. Hrudey *et al.*, "A fatal waterborne disease epidemic in Walkerton, Ontario," *Water Science & Technology*, 47 (2003), 7-14.

[14] Justice O'Connor's report is online at: http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/

[15] Hrudey & Hrudey, *op. cit.* [note 1], p. 120.

> Well certainly we weren't given any advice that any of the reductions and the actual dollar expenditures led to any increase in risk to health by any Ministry, including Environment ... [W]hat is also clear is that that had any of those risks been felt to have -- or potential risks, been felt to have been real, we would not have proceeded [verbatim transcript].[16]

As in the case of North Battleford, in the lead-up to the Walkerton tragedy the failures of the provincial government (to see any connection between drastic budget and personnel reductions and the risk profile of the drinking water system); of the regulator (to impose appropriate operating conditions on a risky well; to ensure adequate training of water system operators); and of the operator (to monitor turbidity and maintain the chlorine residual; to inform health authorities of an imminent danger) – were not precipitated by mysterious or complex challenges. Rather, they resulted from willful blindness, simple carelessness, and errors in procedure of a type that had been fully documented a century beforehand.

The North Battleford and Walkerton cases are exhaustively and incisively studied in the volume by Steve and Elizabeth Hrudey, *Safe Drinking Water: Lessons from Recent Outbreaks in Affluent Nations* (2004). Some comfort could be taken from these cases were they shown to be exceptions. However, this does not appear to be the case.[17]

[16] Walkerton Inquiry Transcripts: http://www.tscript.com/ , Walkerton Inquiry, 29 June 2001, at pages 82:20-23 and 247:8-11

[17] "These high-profile incidents held much in common with previous waterborne outbreaks elsewhere in the developed world (Hrudey and Hrudey 2004). Most notable was the reality that the failures leading to this disaster and many others were failures to implement sound water treatment practices that were well known and established." Steve E. Hrudey, "Drinking-Water Risk Management Principles for a Total Quality Management Framework," *Journal of Toxicology and Environmental Health, Part A*, 67: 1555-64 (2004), 1555.

The occurrence of basic failures in managerial oversight and staff performance has been extensively documented in other industries, notably the nuclear power stations operated by Ontario Hydro (now Ontario Power Generation). In 1997 an external audit by the Nuclear Performance Advisory Group (NPAG) rated the performance of the entire group of three nuclear stations – Pickering, Darlington, and Bruce – on ten different criteria: training, maintenance, engineering, emergency preparedness, operations, quality, radiation protection, chemistry, organizational effectiveness, and security (the security rating was classified). On *all nine* of the publicly-reported criteria, all stations were rated as either "below standard" or "minimally acceptable."

As a result, the group recommended that seven out of a total of nineteen reactors should be shut down and withdrawn from service. Their analysis of failure includes the following indictments:[18]

> There are significant numbers of managers at all levels of the nuclear organization who lack the basic management and leadership skills to be successful. They lack a fundamental understanding of the need for and value of a consistent, integrated managerial system.
>
> Employees lack a questioning attitude; deficiencies with safety systems are tolerated at all levels of the organization; procedures are violated and management is tolerant; justifying that "that is OK"; managers, staff and suppliers are not accountable for timeliness or meeting quality and safety standards. Staff are in effect rewarded for poor performance; training in safety and job related accountabilities and authorities, procedures and tasks is insufficient or ineffective;...

What I referred to earlier as the "bottom line" in risk management – the daily delivery of incremental improvements in risk reduction and risk mitigation – has been

[18] http://www.ccnr.org/hydro_report.html

expanded by Hrudey into a more specific set of "principles" for total quality management in the drinking water industry. These include:

- anticipate and prevent harm rather than just reacting to problems;
- set priorities;
- seek actions that will achieve the greatest overall reduction of risk;
- maintain vigilance and fight complacency.[19]

Although there are cases where failures are attributable to simple ignorance of accepted risk management approaches, failures also can and do arise from focusing on rote obedience to manuals of procedure – or from assuming that the successful achievement of regulatory benchmarks is an occasion for celebration and relaxation. For manuals reflect the "state-of-the-art" of best practices on the day they were written, and regulatory benchmarks enshrine (at least ideally) the state of scientific knowledge on the day when some bureaucratic apparatus brought to a close its long, slow process of turning reliable knowledge into enforceable law. But when was the manual last updated? And how much time has elapsed (during which scientific knowledge has advanced) since the benchmarks were re-evaluated?

For effective risk managers there is no appropriate end-state except that of daily vigilance and continuous improvement. Compliance with standards and regulations is a minimal, not maximal, achievement – a necessary, but not sufficient, basis for preventing the next tragedy.

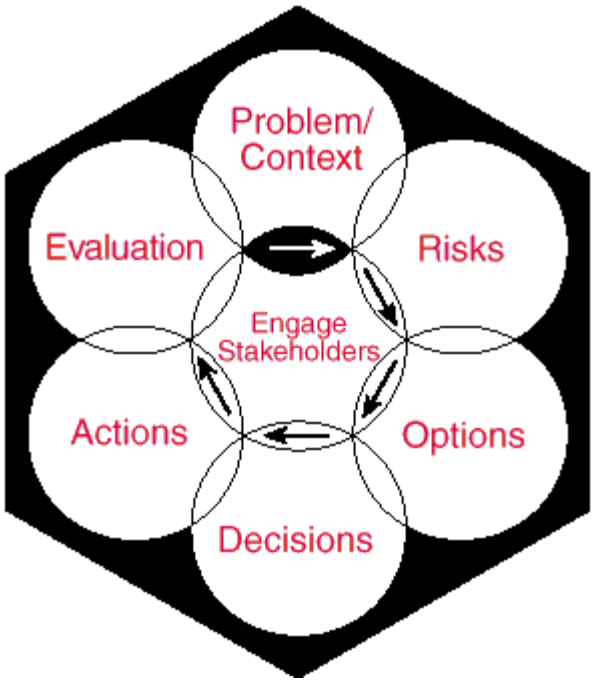
[19] *Ibid.*, pp. 1559ff.

Type 3 Failure: Undervaluing Public Engagement.

Every good RM plan, when carried through to the risk mitigation point, inevitably has implications for other agencies, businesses, and other external stakeholders. Therefore, a timely and open engagement with other stakeholders is an essential part of the plan – since it cannot be carried out successfully without their willing cooperation.

It is fair to say that these element was entirely absent in the first phases of the development of the conventional paradigm of risk management. But there was an entirely new turn in this conception in 1997, with the appearance of the two-volume report of the U. S. Presidential Commission on Risk Assessment and Risk Management.[20] This report became best-known for its logo:

[20] See generally U.S., Presidential Commission on Risk Assessment and Risk Management, *Final Report, 1997,* Volume 2*: Risk Assessment and Risk Management in Regulatory Decision Making*, available online at: http://www.riskworld.com/Nreports/1996/risk_rpt/RR6ME001.HTM



Every aspect of this diagram marked a sea-change in the conception of the RM process. Notable features are its starting-point, in "context," and its representation of the overall process as an interconnect series of circles. But the most dramatic feature is the centrality of the "engage stakeholders" circle as well as its connection with every one of the other stages in the process as a whole.

The "separation" of risk assessment and risk management, which had been the hallmark of the earlier phase, was effectively undermined in the new conception. It had been challenged more and more frequently by groups outside of the formal regulatory framework – public-interest groups, community-based associations, and citizens among the general public. Certainly this challenge had a basis in resistance against the frequent use of complex technical jargon and statistical expressions in the risk assessment

exercises, and also in the common failures of risk managers to make any decent effort to communicate effectively with the public.[21]

Second, risk managers failed to realize that their decision making exercises had the characteristics of a "black box": the decision inputs may have been described in detail, but all too often the logical connections between the inputs and the output (the decision) were not at all self-evident. Finally, this resistance had another, more general grounding in the decreasing level of trust on the public's part towards the institutions of industry and government. The result has been that risk managers regularly face the threat that the public will disavow or resist their elaborate attempts to rationalize regulatory decisions by using the language of risk assessment and management.

Examples abound. Quite recently, Health Canada's reassessment of the health risks of the pesticide 2,4-D, some fifteen years in the works, has been largely ignored by municipal officials and citizens who are determined to banish lawn pesticides from their cities.[22] There are long-running controversies about what experts believe are small risks, such as those arising from dioxins or endocrine disruptors, a belief that is not shared by many citizens.[23] Public health officials in many countries face tremendous challenges in the face of widespread public skepticism about the safety of vaccines,

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[21] Some case studies of such failures are presented in W. Leiss & D. Powell, *Mad Cows and Mother's Milk* [note 9] and in my two other volumes: *Risk and Responsibility* (1994) and *In the Chamber of Risks* (2001), both from McGill-Queen's University Press.

[22] http://www.pmra-arla.gc.ca/english/highlights/in20050221-e.html ; http://www.flora.org/healthyottawa/fs-4.htm ; http://www.healthylawns.net/english/municipalities/municipalities-e.html .

[23] http://www.emcom.ca/

where the societal risk/benefit calculus appears to greatly outweigh the small individual risks of adverse effects.[24] And large segments of the public in Canada and elsewhere – as well as a fair number of people with some expertise in risk matters – do not appear to accept the case for the safety and operational integrity of nuclear energy plants which is presented by the nuclear industry and the many governments which have supported that industry for decades.[25]

Increasingly, therefore, risk managers in government and industry are faced with public reactions to the risk management approach which are far more complex than has been generally imagined. They are obliged by regulatory requirements to carry out risk assessments within a standard risk management framework, but more and more they must also be prepared to engage the public directly on a larger set of issues surrounding the risk-based approach, issues that are framed by types of concerns that are deeply rooted in popular opinion. In more technical terms, risk managers face the situation where the public perceptions about risks can deviate substantially from their own – and, increasingly, risk managers are unable to simply take refuge in their expertise and remain indifferent, or hostile, to those public perceptions. Competence in risk management must be complemented, these days, with a very different type of expertise – namely, competence in engaging stakeholders and the public on matters of risk acceptability.[26]

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[24] Vaccination Risk Awareness Network: http://www.vran.org/

[25] http://www.ucsusa.org/clean_energy/nuclear_safety/nuclear-plant-risk-studies-failing-the-grade.html

[26] Stakeholders are individuals, informal groups, communities, corporate entities, and organized interest groups who have a *prima facie* entitlement to be involved in public decision-making

Stakeholder engagement is one of the commonest forms of the more general process, "public participation in decision-making"; the latter is enshrined as a fundamental right of all peoples in the United Nations' "Aarhus Convention."[27] Since effective participation depends in the first instance on adequate provision of information to the public about environmental matters, this Convention enshrines a presumption in favor of public release, putting the onus on authorities to justify any restrictions and establishing a specific list of exemptions where withholding information is justified.

The Risk Calculus in the Context of Stakeholder and Public Engagement.

Thus risk managers will always have to do their work while being aware of certain parameters of uncertainty so far as the determination of acceptable risk – at any particular point in time, and with respect to their specific type of business – is concerned. In layman's terms acceptable risk is "safety," and there is an excellent formulation of what this means:

> A pragmatic notion of safety is a level of risk so small that a reasonable, well-informed individual need not be concerned about it, nor find any rational basis to change his/her behaviour to avoid a negligible but non-zero risk.[28]

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processes. Normally, some agency of government, or a body otherwise authorized by government, will have the responsibility for the liaison function with stakeholders, for any specific decision process. Also, the "rules of engagement" are almost always informal ones, although in some cases there are formal administrative-law procedures in place for such events.

[27] United Nations, "Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters," 1998 [Aarhus Convention]: http://www.unece.org/env/pp/

[28] Hrudey & Hrudey, *op. cit.* [note 1], p. 4.

This is an eminently sane proposition. But every risk manager needs to be fully aware that here he or she is in what may be called a "permanently contestable zone." In other words, both what is or should be a matter of "concern" to anyone, and what a "reasonable" response – especially by someone in a position of responsibility – is to that concern, are always disputable. Only by keeping this elementary fact always uppermost in mind can risk managers hope to succeed in their difficult endeavour.

What the risk manager knows – or should know, in someone else's opinion – at any particular point in time, about all the risks pertinent to his or her area of business, as well as what management decisions are taken (or not) based on that knowledge, goes to the heart of the risk management enterprise. This can be well illustrated by the recent controversies surrounding the risks associated with the class of drugs known as cox-2 inhibitors (Vioxx, Celebrex, Bextra and others). Here is one commentary on the situation:

> Internal company documents show that Merck employees were debating the safety of the drug [Vioxx] for years before the recall. From a scientific perspective, this is hardly damning. The internal debates about the drug's safety were just that – debates, with different scientists arguing for and against the drug.... And there's no clear evidence that Merck kept selling Vioxx after it decided that the drug's dangers outweighed its benefits. While that kind of weighing of risk and benefit may be medically rational, in the legal arena it's poison. Nothing infuriates juries like finding out that companies knew about dangers and then "balanced" them away.[29]

The lesson – and the dilemma – here is a simple one: No risk manager can avoid making judgments about both the acceptable level of risk, because risk is never non-zero, or about

[29] James Surowiecki, "Don't do the math," *The New Yorker*, January 24-31, 2005, p. 38.

what the right balancing of risk, cost, and benefit is at any time. And these are just the kind of judgments that can get one in serious trouble when things go wrong, as they will.

One of the greatest difficulties in this dilemma is what to tell your stakeholders and your public about what you know, when you gained this knowledge, what in that knowledge may be relevant to their concerns about risks, and what decisions you made (or not) based on it – including decisions about what you decided to share with them. This is one of the primary *organizational risks* associated with the practice of good risk management. There is no perfect solution to this dilemma. The main point here is that an organization should be aware of this "double layer" of potential responsibility (and, of course, liability): The duty to conform to regulatory and/or ethical standards of good risk management practice, on the one hand, and the need to manage the organizational risk of doing effective risk management, on the other.

I shall make only one type of recommendation here. In general, and "all other things being equal," I believe that a strong case can be made for full and timely disclosure to the public of all risk information relevant to the organization's line of business, including disclosure of the management decisions made on the basis of current information. That said, there is a necessary precondition, namely, making an effort on an ongoing basis – which means investing time and resources – to enlarge the public's understanding of the language of risk itself.

The reason is that risk is a devilishly tricky language, for so many reasons – the essential difference between hazard and risk, the differential level of consequences for

exactly the same level of exposure (as influenced by age, gender, genetic factors, etc.), the mysteries of statistical expression, the inevitability of uncertainties, and so forth. The public needs help in this regard, help from sources whom they can trust. "Raw" risk data is almost never helpful, but on the other hand, interpreting the data fairly and honestly can sometimes get one into trouble. A lot of practice helps, as it usually does for difficult tasks of all types. So the sooner one starts, the better off one will be.

By and large, I think it is fair to say that the basic logic of the Presidential Commission logo – putting the "engage stakeholders" theme at the centre of all risk management activities – is a long way from being implemented in most organizations that manage risk. Rhetorical obeisance to this paradigm is common, but rarely is it matched with the one thing that could turn it into reality, namely, an appropriate allocation of the organization's resources and commitments. And yet, as citizens become more adept at accessing pertinent information (using the Internet) and at confronting organizations with different perceptions of risks, decisions that essentially pay lip service to the "engage stakeholders" mantra increasingly will fail.

Conclusions.

The established practices in risk management have proved their usefulness in controlling within acceptable levels risks in a countless range of practical applications. However, these practices are not without their own challenging complexities, especially when it comes to the technical side of the business, namely, quantitative risk assessments. These complexities do not only bedevil many members of the public, who can react badly when

risk managers fall back on technical jargon, such as probabilistic expressions, in an effort to explain what they are doing and why the public should trust them.

This much is fairly well known by now. Less well known is the challenges faced by organizations in training their personnel to zero in on the most essential requirements of the risk management approach – as opposed to, for example, focusing only on completing the steps in the manual of procedures. These essential requirements may be summarized as follows:

1. Complete – and continuously update – the risk profile pertinent to the organization and allocate resources in proportion to the results of the risk ranking matrix.
2. Mandate continuous improvement in risk reduction and mitigation for all of the most highly-ranked risks that are to be managed.
3. Make stakeholder engagement the real and vital centre of the risk management enterprise.