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Risk is More Than Just a Number

Wim F. Passchier & Wim C. Reij*

Introduction

A committee of the Health Council of the Netherlands has issued two reports on the scientific basis of risk assessment and risk management in environmental policy. The first¹ discussed the basis of the present policy in the Netherlands, and the second² presented the views of the committee on developing a risk management approach. This article closely follows the Executive Summary of the latter.

Risk and the Origin of Risk

Risk is inextricably related to any human action.³ The committee defines risk as the possibility of damage to health, environment and goods in combination with its nature and magnitude. Risks are ultimately caused by human demands and needs that generate human action, e.g., developing and operating a chemical plant, living below sea level, drinking alcohol and traveling by car. Such activities can lead to damage or loss involving human health, the environment or goods.

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¹ Health Council of the Netherlands, Committee on Risk Measures and Risk Assessment, *Not All Risks Are Equal* (1995).

² Health Council of the Netherlands, Committee on Risk Measures and Risk Assessment, *Risk is More Than Just a Number* (March 1996).

³ Also natural processes may be detrimental to human and environmental health, although in some cases short term detriment may lead to long term benefits.

The aim of human activities is to produce benefits, but the inevitable side effect is the creation of risks. This is why risks cannot be viewed separately from benefits. The figure below shows both benefits and possible undesirable effects.

Generation of Risk and Classification of Possible Effects

<i>Human demands Human needs</i>	<i>Human action, change in substance and energy flows, stressors, exposure</i>	<i>Possible harm or loss</i>
<ul style="list-style-type: none"> • Motives, • Selection 	<ul style="list-style-type: none"> • Planned implementation • Deranged implementation 	<ul style="list-style-type: none"> • Intended desired effects • Direct undesired effects • Indirect undesired effects of options • Direct undesired effects • Indirect effects

When assessing risks for human and ecological health, it is important to distinguish activities that proceed as planned and activities that do not. This makes it possible to make a distinction between the risk contribution of (unplanned) accidents and risk contributions of a less incidental nature (e.g. those associated with licensed emissions).

The committee points to indirect effects of risk, such as economic damage and employment loss after serious accidents. These are often neglected in risk analyses even though they can be the most important aspect of the risk. Indirect effects are also related to the fact that only limited resources are available for risk management. The choice of a specific option for risk reduction competes with deploying the same resources for reducing other risks or for satisfying other needs. In risk management, one should account for “opportunity costs” generated because resources once deployed are no longer available.

The Process of Risk Assessment and Risk Management

The committee advocates coping with risks by a transparent process. This makes it clear for all involved when and why a decision has been proposed or made — and by whom. Assessment encompasses: problem description, risk analysis and risk characterization. During problem description, the scope and nature of the problem are

determined. Social preferences inevitably play a part. This makes consultations between risk managers and assessors necessary, with managers expressing preferences of parties involved.

The outcome of risk analysis is an estimate which is expressed using a variety of characteristics or attributes and may be thought of as the risk profile of the human action under consideration. The selection of relevant risk attributes cannot be left to the assessor. Here again, the risk manager should represent the preferences of the parties. Examples of characteristics are: probability of disease or death, the reduction of species in ecosystems and the level of training of industrial operators.

During the risk management stage, a decision is made about the tolerability of the risk. In the context of the present report, that decision is made by the government. Measures will be taken on the basis of the decision to keep the risk within acceptable limits, and the effectiveness of these measures will be monitored.

The committee advocates a dynamic process of risk assessment and management. In the assessment stage, one may conclude that the scope of the problem is different, usually more extensive, than originally determined. Also, one may wish to study alternative abatement strategies. Parts of the process are then again passed through. Feedback from actual practice may lead to reviewed risk estimates and adaptation of risk measures.

Not All Risk Problems Are Equal

The committee believes that several factors have considerable influence on the way risk problems are assessed and how decisions are made about them:

- scope of the risk in time,
- spatial scope of the risk,
- uncertainty about the nature and scope of the risk, and
- societal importance of the activity that causes the risk.

Together with the jurisdiction of the authority that makes these decisions, these facets determine the status of the problem: Is it strategic, tactical or operational? The higher the problem "scores" on one of the four dimensions, the more it shifts from operational to strategic. The status of the problem is not rigid. In general, each problem has strategic, tactical and operational aspects. The

development of the Port of Rotterdam, with its industrial operations, may be viewed as a strategic problem; the construction of the so-called "Betuwe railway-line" for the transport of goods from Rotterdam to the German hinterland, as a tactical choice; and noise reducing measures taken in houses along the railway-line, as operational.

Criteria for Determining the Nature of a Risk Problem:

Is its character mainly operational or strategic?

From Operational	to	Strategic
a. Fits in with all established decision methods and criteria?	->	Results in new decision methods and criteria?
b. Accords with scientific knowledge?	->	Consistent arguments? Well thought-out vision?
c. Risk attributes adequate for protection objective?	->	Various protection objectives taken into account?
d. Risk within previously established tolerability limits?	->	Does the societal benefit outweigh the risk according to various parties?
e. Risk management for lowest costs	->	Efficient after consideration of opportunity costs?

Different risk problems require different risk management strategies. The latter has to be adapted to how risks arise. They are, at least in the case of problems which have previously arisen, set down or referred to in environmental legislation and regulations. The committee points to the necessity, especially in the case of problems of strategic importance, of creating an environment in which justice is done to a variety of political views and cultures, i.e., to a variety of risk perceptions. This makes fruitful discussion possible between affected parties before government makes decisions about accepting certain risks — and about associated conditions.

As stated, the intended benefits of activities play a role in arriving at a decision. A possible problem is that those involved can differ in their assessments of the social importance of the activity, depending on their vision of society and their position with respect to the activity and the risk (risk-takers, beneficiaries, victims, or combinations of the three). This is especially true for strategic questions, as is demonstrated by the discussions on the energy policy and on public transport systems

(expansion of Schiphol Airport near Amsterdam, connecting to the European high speed train network). In the case of risk problems with a marked operational nature, social benefits are often not discussed explicitly because the usefulness of the risky activities is often thought to go without saying.

Risk Management

Risks do not come about on their own. An analysis of the cause and effect sequence shows various opportunities for risk management. Here, the “quality of the organization” and “priority setting and risk comparison” will be discussed.

Quality Control — In effective and efficient risk management, the way activities are organized plays a central role: Risk management should be a part of a system of quality control. In the case of industrial processes, this system starts on the drawing board, has implications for employee training at all levels, and is related to, e.g., maintenance and disposal of waste products. Feedback is important: Experience with the control system should result in alterations and improvements that should also include risk management measures.

Quality control should also be the motto for government with respect to involvement in risk assessment and risk management. This leads to an organization of the process that is transparent, appropriate to the nature of the problem and grants a central position to risk communication.

Risk management through quality control and communication are particularly applicable if diversion is an important cause of the risk. Diversion onto other parts of the world or future generations means that risk takers no longer perceive the possible harmful effects of their activities in those terms; an important motive for risk reduction is lacking. Another diversion mechanism shifts risks from individuals to the collective; many individuals or bodies believe that they can quite reasonably take risks on their own, but the *combined* risk can become intolerable.⁴

⁴ Consider, e.g., private car transport. For individuals, the benefits for a particular trip usually outweigh the risks, with respect to both the health of the individual and environmental effects. Yet, as many individuals make similar decisions at the same time the collective risk may exceed the collective benefits, and risk reduction measures may be in order (e.g. using public transportation).

Priority Setting and Risk Comparison — How should environmental dollars be spent? This is the question faced by the government in tackling various environmental problems it encounters. There are two problems in priority setting: What do we *not* do if we deploy the available resources for a particular problem and what risks does *that* involve? How do we compare efforts involved in one problem with those involved in another?

When answering these questions, it can be helpful to make a link between the costs of risk management measures and the level of risk reduction which they aim to achieve. The committee recommends that the following risk attributes should be taken into account: reduction in life expectancy and quality of life, nuisance, negative appreciation of the environment, reduction of biodiversity, reduced functioning of ecosystems and reduction of environmental functions. Comparative risk analysis may provide a solution for the comparison of problems of different kinds. In such an analysis, experts or representatives from social groups and government officials rank problems in consultation.

Different Approaches to Dissimilar Risks

How can government manage risks and take the individual nature of various kinds of problems into account during the process? For matters of a mainly operational nature, the committee proposes choosing between:

- strict standardization,
- balancing risk reduction against reduction costs, and
- self-regulation with requirements for the organization of the activity.

“Standardization” includes government decisions about conditions for acceptance of risks, the form of risk management measures, and the desired level of risk reduction. The second point relates to the application of the ALARA principle: The reduction of risks to a level that is *as low as is reasonably achievable*. Risk reduction may also be unreasonable if other beneficial activities may not be carried out because of the lack of resources. The third point, self-regulation, can improve the quality of the organization of the activity which causes the risk. At the same time, it imposes stringent demands on the monitoring role of

government to which the “self-regulated” is accountable. Risk communication plays an important role in this respect.

There are no generally accepted approaches in current Dutch government policy for problems with a less operational, more strategic nature. The committee lists the following possibilities:

- breaking down the problem into parts for which there are acceptable risk management approaches,
- taking measures on the safe side, particularly if consequences are irreversible,
- searching for measures to stimulate risk reduction (bonuses) or encourage risk acceptance of (insurance), and
- determining the extent to which and the conditions in which compensation can play a role in controlling risk distribution judged to be unfair.

In problems of major strategic importance, government must initiate and follow procedures that create conditions for good understanding among all those involved of the particular risk problem, of how the different parties approach the problem, and of the decision-making criteria that will be followed. Measures will primarily consist of encouraging some developments and discouraging others to manage risks without creating excessive obstacles to the functioning of the society.

It may be helpful in this respect to classify measures according to the costs of estimated levels of risk reduction on relevant risk attributes. The committee believes that the following deserve particular attention:

- Strategic problems are complex in nature and generally unique. They cannot therefore be tackled using standard approaches. A failure to recognize the need to look for new approaches — generally a mixture of various tactics — can interfere with efficient risk management. Global climate change is an example.
- All parties involved can be expected to indicate how the activities which cause the risk advance the public interest. They should also state whether this benefit off-sets the risks and, in particular, how the risk is distributed across the various parties. Each party should clarify which distribution of risk and benefits it considers just.

Strategic risk problems make it necessary to look for new ways to cope with risks: *Who decides, when*, about the tolerability of *what* part of the risk, and *who is responsible* for keeping risk acceptable?

Risk is More Than Just a Number

Risk management questions are questions about the structuring of the society. The answers are determined by beliefs about the vulnerability of nature, concern for future generations, and freedom of action.

Supplying milk in plastic bottles and the construction of a network of high-speed train tracks are both types of human activities that, in addition to serving meaningful objectives, threaten human health and the environment. Milk supply and fast trains are, however, different in nature, scope and societal importance, and the risks involved cannot therefore be assessed in the same way. The different nature and extent of risk management measures will partly depend on the importance that groups in society attach to particular types of packaging and to fast trains.

A transparent, orderly approach to risk assessment and risk management can lead to a result with which the people involved can live. In many cases, this requires much more than just a number.

