

What Is Risk?

RISK IS MORE THAN RISK: WHAT ARE WE TALKING ABOUT?¹

Today's society seems to be preoccupied with the notion of risk. The recent examples – BSE in Europe, the Indian Ocean tsunami, the cyclone in Burma (Myanmar), to name just a few – have gained much attention from the public and have given rise to a growing discontent between the public's desire to see risks reduced and the actual performance of risk management institutions. What do we mean when we use the word risk? Is there anything special about risk that makes it such an important issue in contemporary politics?

All concepts of risk have one element in common: the distinction between possible and chosen action (Renn, 1992b). Philosophers call this contingency. At any time, an individual, an organization or a society, as a whole, faces several options for taking action (including doing nothing), each of which is associated with potential positive or negative consequences. If option A is not taken, a possible future pathway is (deliberately) excluded. Sometimes a decision can be reversed if the consequences turn out to be worse than expected and the original choice situation can be restored; but there is never a possibility to start all over again. A decision reversal always represents a new decision under new circumstances. Thinking about risks helps people to select the option that promises at least a marginal benefit compared to all other available options. Humans have the ability to design different futures (i.e. construct scenarios that serve as tools for the human mind in order to anticipate consequences in advance and to change, within the constraints of nature and culture, their course of actions accordingly). If the future were either predetermined or independent of today's human activities, the term 'risk' would make no sense. This may seem obvious to modern readers, but only in the context of fairly recent developments in our own culture, and contrasts sharply with more fatalistic views of nature and society.

If the contingent nature of our actions is taken for granted, the term 'risk' denotes the possibility that an undesirable state of reality (adverse effects) may occur as a result of natural events or human activities (definition originally in Kates et al, 1985, p21). This definition implies that humans can, and will, make causal

connections between actions (or events). They can be altered either by modifying the initiating activity or event, or by mitigating the impacts. The definition of risk therefore contains three elements: outcomes that have an impact upon what humans value; the possibility of occurrence (uncertainty); and a formula to combine both elements. Outcomes can, in principle, be positive or negative, depending upon the values that people associate with them. For the purpose of this book and in accordance with our definition above, we will focus here on the negative outcomes of actions or events.

In addition to the strength and likelihood of these consequences, other aspects of risk need special attention – for example, the distribution of risks over time, space and populations. In particular, the timescale of adverse effects appearing in specific time intervals is very important and links risk governance to sustainable development (delayed effects).

SOCIAL CONSTRUCTIVISM VERSUS REALISM

There is a major debate among risk professionals about the nature of risks: are risks social constructions or real phenomena? The issue here is whether technical risk estimates represent ‘objective’ probabilities of harm or only reflect the conventions of an elite group of professional risk assessors that may claim no more degree of validity or universality than competing estimates of stakeholder groups or the lay public.² Furthermore, different cultures may have different mental representations of what they regard as ‘risks’ independent of the magnitude or probability of harm. On first glance it is obvious that risks constitute *mental models* (OECD, 2003a, p67). They are not real phenomena, but originate in the human mind. Actors, however, creatively arrange and reassemble signals that they get from the ‘real world’, providing structure and guidance to an ongoing process of reality enactment.³ Therefore, risks represent what people observe in reality and what they experience. The link between risk as a mental concept and reality is forged through the experience of actual harm (the consequence of risk) in the sense that human lives are lost, health impacts can be observed, the environment is damaged or buildings collapse. The invention of risk as a mental construct is contingent upon the belief that human action can prevent harm in advance.

The status of risk as a mental model has major implications for how risk is perceived. Unlike trees or houses, one cannot scan the environment, identify the objects of interest and count them. Risks are created and selected by human actors. What counts as a risk to someone may be an act of God to someone else or even an opportunity for a third party. Although societies have, over time, gained experience and collective knowledge of the potential impacts of events and activities, one cannot anticipate all potential scenarios and be worried about all of the many potential consequences of a proposed activity or an expected event. By the same token, it is impossible to include all possible options for intervention. Therefore,

societies have been *selective* in what they have chosen to be worth considering and what to ignore (Douglas, 1990; Thompson et al, 1990; Beck, 1994, pp9ff). Specialized organizations have been established to monitor the environment for hints of future problems and to provide early warning of some potential future harm. This selection process is not arbitrary. It is guided by cultural values (such as the shared belief that each individual life is worth protecting), by institutional and financial resources (such as the decision of national governments to spend money or not to spend money on early warning systems against highly improbable but high-consequence events) and by systematic reasoning (such as using probability theory for distinguishing between more likely and less likely events or methods to estimate damage potential or distribution of hazards in time and space).⁴

Ultimately, whether the evidence collected for assessing and evaluating risks represents human ideas about reality or depicts representations of reality is more or less irrelevant for the distinction between evidence and values that is suggested throughout the risk governance framework that forms the basis of this book (IRGC, 2005). Those interested in going into greater depth on this issue will find it useful to explore further readings.⁵

The framework, hence, tries to avoid the naïve realism of risk as a purely objective category, as well as the relativistic perspective of making all risk judgements subjective reflections of power and interests. What the framework emphasizes is that risk governance must deal with both the ‘physical’ and ‘social’ dimensions of risk. It is important to expand the set of criteria for assessing, characterizing, evaluating and managing risks beyond the largely technological or scientific factors that have dominated earlier models of risk governance. Public values, concerns and perceptions of risk are often equally important for identifying, understanding and managing risks and must be included. Whether these perceptions have a direct correspondence with the physical world is irrelevant as long as people feel that these perceptions matter to them or to the objects and persons whom they care about. Addressing these concerns may include changes in the physical world, such as adding an additional safety layer; but very often it may be more effective to improve trust in the risk operating systems or to provide more personal control over the extent of the risk. If specific perceptions are clearly in violation of the best scientific knowledge about the likely effects of events, technologies or human actions, it is the task of risk managers to provide evidence-based information that help people to understand the causal relationships that they may have misjudged. A vast majority of studies on risk perception and concerns tends to show, however, that most of the worries are not related to blatant errors or poor judgement, but to divergent views about the tolerability of remaining uncertainty, short-term versus long-term impacts, the trustworthiness of risk-regulating or risk-managing agencies, and the experience of inequity or injustice with regard to the distribution of benefits and risks. All of these concerns are legitimate in their own right and valid for the respective policy arena. They cannot be downplayed by labelling concerns as irrational fears. This is why the framework emphasizes the need for both

risk assessment and concern assessment in the *risk appraisal* phase, as explained in Chapter 3.

Risk assessments are therefore ‘mental models’ that are based on observations and perceptions or social constructions of the world that can be justified by logical reasoning (reflecting varying degrees of knowledge and consistent with fundamental axioms of mathematics and probability) or can be verified by comparisons with what actually happens. Public values, perceptions and social concerns can act as the driving agents for identifying those topics for which risk assessments are judged necessary or desirable and for ultimately evaluating the acceptability or tolerability of those risks. Whether based on scientific predictions or public perceptions, estimates for the magnitude of risks, however, should reflect technical expertise as well as possible since the implications of taking action – for health, the environment or the economy – may be very real.

From there it follows that managing risks will inevitably be directed by relevance claims (e.g. what matters to society and what are important phenomena that should receive our attention?), evidence claims (e.g. what are the causes and what are the effects?) and normative claims (e.g. what is good, acceptable and tolerable?). Identifying what is relevant and worth further investigation is clearly a task that demands both sufficient knowledge about impacts and a broad understanding of the basic values and concerns that underlie all procedures of selection and priority setting. This important stage of selection and framing forms a separate first phase of our framework, including several sub-tasks. After this first preliminary phase, the framework distinguishes between knowledge acquisition and evaluative judgements. This distinction is done in spite of the common understanding that providing evidence is always contingent upon existing normative axioms and social conventions. Likewise, normative positions are always enlightened by assumptions about reality (Ravetz, 1999). The fact, however, that evidence is never value free and that values are never void of assumptions about evidence does not compromise the need for a functional distinction between the two. In managing risks one is forced to distinguish between what is likely to be expected when selecting option X rather than option Y, on the one hand, and what is more desirable or tolerable: the consequences of option X or option Y, on the other. As a result, it is highly advisable to maintain the classic distinction between evidence and values, and to affirm that justifying claims for evidence versus values involves different routes of legitimization and validation. We maintain this distinction in the framework by having both *risk characterization* and *risk evaluation* as inputs to judgements about tolerability and acceptability.

SCOPE OF RISKS

Table 1.1 provides a systematic overview of the sources of risks or hazards that potentially fall within the scope of our risk definition. The purpose of this overview

is to lay out the variety of sources of risks, rather than to claim that the categories proposed are exhaustive or mutually exclusive (see a review of classification in Morgan et al, 2000). In addition to the individual risk sources mentioned in Table 1.1, we have given special attention to the emergence of a new concept of risk, which the Organisation for Economic Co-operation and Development (OECD) has labelled '*systemic risks*' (OECD, 2003a). This term denotes the 'embeddedness' of any risk to human health and the environment in a larger context of social, financial and economic consequences, and increased interdependencies both across risks and between their various backgrounds. Systemic risks are at the crossroads between natural events (partially altered and amplified by human action, such as the emission of greenhouse gases), economic, social and technological developments, and policy-driven actions, all at the domestic and the international level. These new interrelated and interdependent risk fields also require a new form of handling risk, in which data from different risk sources are either geographically or functionally integrated within one analytical perspective. Handling systemic risks requires a holistic approach to hazard identification, risk assessment, concern assessment, tolerability/acceptability judgements and risk management. Investigating systemic risks goes beyond the usual agent-consequence analysis and focuses on interdependencies and spillovers between risk clusters.

RISK FROM A BROADER PERSPECTIVE

Risks appear in a broader context of how humans transform the natural into a cultural environment with the aim of improving living conditions and serving human wants and needs (Turner et al, 1990). These transformations are performed with a purpose in mind (normally a benefit to those who initiate them). When implementing these changes, intended (or tolerated) and unintended consequences may occur that meet or violate other dimensions of what humans value. Risks are not taken for their own sake; they are rather incurred, actively or passively, being integral to a specific activity. In this context, it is the major task of risk assessment to identify and explore, preferably in quantitative terms, the types, intensities and likelihood of the (normally undesired) consequences related to an activity or event. In addition, these consequences are associated with special concerns that individuals, social groups, or different cultures may attribute to these risks. They also need to be assessed in terms of making a prudent judgement about the tolerability or acceptability of risks. Once that judgement is made, it is the task of risk management to prevent, reduce or alter these consequences by choosing appropriate actions. As obvious as this distinction between risk and concern assessment (as a tool of gaining knowledge about risks) and risk management (as a tool for handling risks) appears at first glance, the *distinction becomes blurred* in the actual risk governance process.

Table 1.1 *Risks taxonomy according to hazardous agents***Physical agents**

- Ionizing radiation
- Non-ionizing radiation
- Noise (industrial, leisure, etc.)
- Kinetic energy (explosion, collapse, etc.)
- Temperature (fire, overheating, overcooling)

Chemical agents

- Toxic substances (thresholds)
- Genotoxic/carcinogenic substances
- Environmental pollutants
- Compound mixtures

Biological agents

- Fungi and algae
- Bacteria
- Viruses
- Genetically modified organisms (GMOs)
- Other pathogens

Natural forces

- Wind
- Earthquakes
- Volcanic activities
- Drought
- Flood
- Tsunamis
- (Wild) fire
- Avalanche

Social-communicative hazards

- Terrorism and sabotage
- Human violence (criminal acts)
- Humiliation, mobbing, stigmatizing
- Experimentation with humans (such as innovative medical applications)
- Mass hysteria
- Psychosomatic syndromes

Complex hazards (combinations)

- Food (chemical and biological)
- Consumer products (chemical, physical, etc.)
- Technologies (physical, chemical, etc.)
- Large constructions such as buildings, dams, highways, bridges
- Critical infrastructures (physical, economic, social-organizational and communicative)

Source: adapted from IRGC, 2005, p20

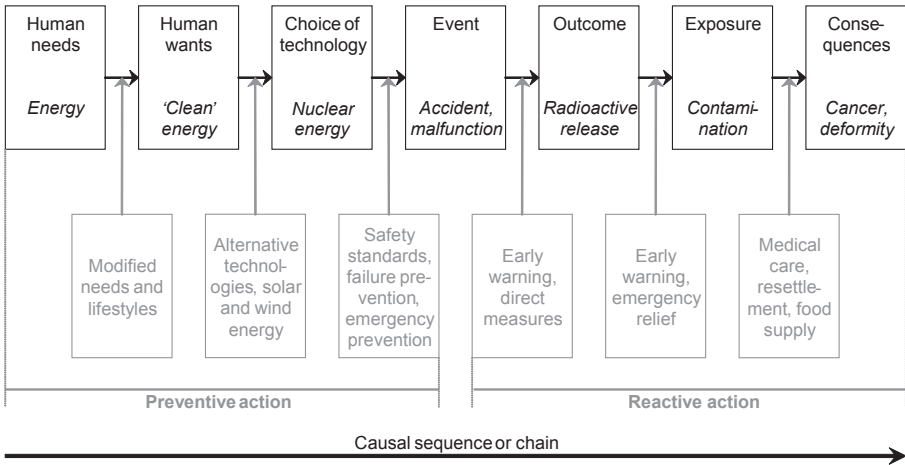


Figure 1.1 *Seven steps of a risk chain: The example of nuclear energy*

Source: adapted from Hohenemser et al, 1983 and from IRGC, 2005, p21

This blurring is due to the fact that assessment starts with the respective risk agent or source and tries to both identify potential damage scenarios and their probabilities, and to model its potential consequences over time and space, whereas risk management oversees a much larger terrain of potential interventions (Jasanoff, 1986, pp79f, 2004; NRC, 1996). Risk management may alter human wants or needs (so that the agent is not even created or continued). It can suggest substitutes or alternatives for the same need. It can relocate or isolate activities so that exposure is prevented, or it can make risk targets less vulnerable to potential harm. Figure 1.1 illustrates this larger perspective for technological risks and lists the possible intervention points for risk management.

Risk assessment and management are, therefore, not symmetrical to each other: management encompasses a much larger domain and may even occur before assessments are performed. It is often based on considerations that are not affected by, or are part of, the assessment results. In more general terms, risk management refers to the creation and evaluation of options for initiating or changing human activities or (natural and artificial) structures with the objective of increasing the net benefit to human society and of preventing harm to humans and what they value. The identification of these options and their evaluation is guided by systematic and experiential knowledge gained and prepared for this purpose by experts and stakeholders. A major proportion of that relevant knowledge comprises the results of risk assessments. However, risk managers also need to act in situations of 'non-knowledge' or insufficient knowledge about potential outcomes of human actions or activities. The most complex questions emerge, however, when one looks at how society and its various actors actually handle risk. In addition to knowledge

gained through risk assessments and/or option generation and evaluation through risk management, the decision-making structure of a society is itself highly complicated and often fragmented. Apart from the structure itself – the people and organizations that share responsibility for assessing and managing risk – one must also consider the need for sufficient organizational capacity to create the necessary knowledge and to implement the required actions, political and cultural norms, and rules and values within a particular societal context, and the subjective perceptions of individuals and groups. These factors leave their marks on the way risks are treated in different domains and socio-political cultures.

WHY RISK GOVERNANCE?

During the last decade the term ‘governance’ has experienced tremendous popularity in the literature on international relations, comparative political science, policy studies, sociology of environment and technology, as well as risk research.⁶ On a national scale, *governance describes structures and processes for collective decision-making involving governmental and non-governmental actors* (Nye and Donahue, 2000). Hutter (2006, p215) characterizes the move from governmental regulation to governance in the following manner:

This decentring of the state involves a move from the public ownership and centralized control to privatized institutions and the encouragement of market competition. It also involves a move to a state reliance on new forms of fragmented regulation, involving the existing specialist regulatory agencies of state but increasingly self-regulating organizations, regimes of enforced self-regulation ... and American-style independent regulatory agencies.

Governing choices in modern societies is seen as an interplay between governmental institutions, economic forces and civil society actors, such as non-governmental organizations (NGOs). At the global level, *governance embodies a horizontally organized structure of functional self-regulation encompassing state and non-state actors bringing about collectively binding decisions without superior authority* (Rosenau, 1992; Wolf, 2002, 2005). In this perspective, non-state actors play an increasingly relevant role and become more important since they have decisive advantages of information and resources compared to single states.

‘*Risk governance*’ involves the ‘translation’ of the substance and core principles of governance to the context of risk and risk-related decision-making (Gunningham et al, 1998). It includes, but also extends beyond, the three conventionally recognized elements of *risk analysis* (risk assessment, risk management and risk communication). It requires consideration of the legal, institutional, social and economic contexts in which a risk is evaluated, and involvement of the actors

and stakeholders who represent them. Risk governance looks at the complex web of actors, rules, conventions, processes and mechanisms concerned with how relevant risk information is collected, analysed and communicated, and how management decisions are taken. Encompassing the combined risk-relevant decisions and actions of both governmental and private actors, risk governance is of particular importance in, but not restricted to, situations where there is no single authority to take a binding risk management decision, but where, instead, the nature of the risk requires the collaboration of, and coordination between a range of different stakeholders. Risk governance, however, not only includes a multifaceted, multi-actor risk process but also calls for the consideration of contextual factors such as institutional arrangements (e.g. the regulatory and legal framework that determines the relationship, roles and responsibilities of the actors, and coordination mechanisms such as markets, incentives or self-imposed norms) and political culture, including different perceptions of risk. Thus, the framework includes several of these dimensions, including concern assessment and explicit discussion of stakeholder participation.

It is useful to differentiate between *horizontal* and *vertical governance* (Benz and Eberlein, 1999; Lyall and Tait, 2004). The horizontal level includes the relevant actors in decision-making processes within a defined geographical or functional segment (such as all relevant actors within a community, region, nation or continent); the vertical level describes the links between these segments (such as the institutional relationships between the local, regional and state levels). Figure 1.2 provides a more explicit portrayal of the interactions between the horizontal and vertical levels of governance in the framework.

		Horizontal levels			
		Governments/ agencies	Industries	Science and academia	Civil society/ NGOs
Vertical levels	Local				
	Regional				
	National				
	Supra- national				
	Global				

Figure 1.2 *Levels of vertical and horizontal governance*

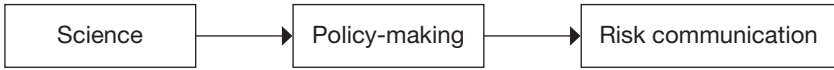


Figure 1.3 *The 'technocratic' model*

Source: adapted from Millstone et al, 2004

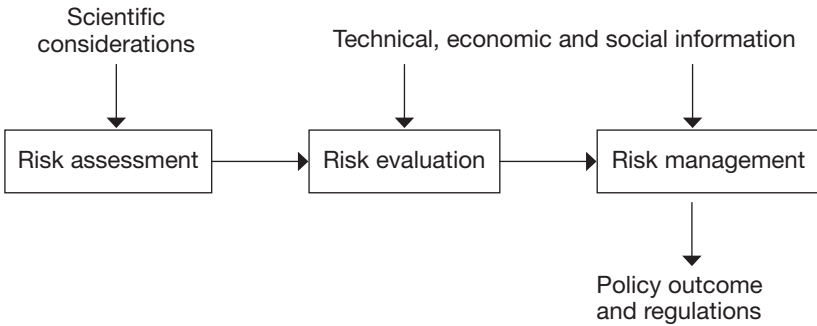


Figure 1.4 *The 'decisionistic' model*

Source: adapted from Millstone et al, 2004

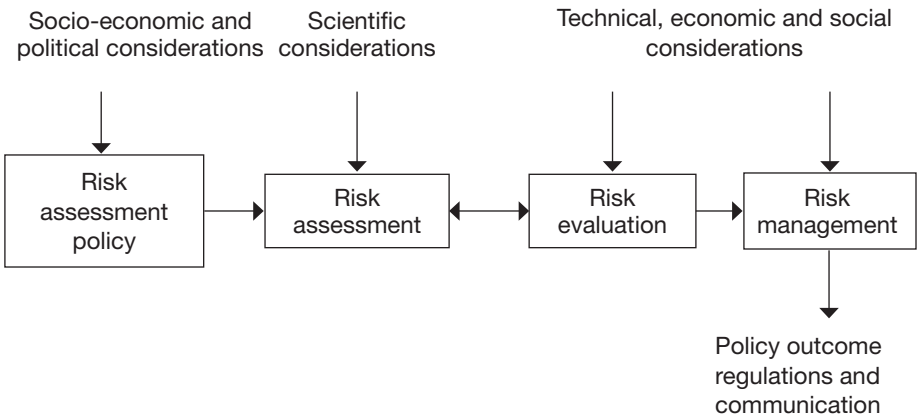


Figure 1.5 *The 'transparent' model*

Source: adapted from Millstone et al, 2004

The vertical governance axis defines the political arena, which ranges from the local to the global level. For example, any federalist government structure is designed along similar vertical governance lines. On each vertical level, different actors from the horizontal axis (governments, economic interests, academic expertise and civil society actors) can join the governance process and contribute either knowledge or values to the process.

The degree of involvement or intersection of these vertical and horizontal elements can depend strongly upon the governance model. Millstone et al (2004) suggest three broad categories of models, each progressively more inclusive of the actors representing the horizontal axis of governance (NRC, 1996) (see Figures 1.3 to 1.5):⁷

- *‘Technocratic’ model.* In this model, objective science is seen to directly inform policy-making; scientists are the best judges of the tolerability of risks and inform policy-makers directly about what they should do.
- *‘Decisionistic’ model.* This model corresponds closely, although not exactly, to that illustrated by the National Research Council’s (NRC’s) Red Book (NRC, 1983). In this model, policy-making requires inputs other than science in order to make decisions, and other legitimate factors (such as those relating to socio-political and economic objectives) need to be taken into account in addressing risks. In 1983, the Red Book established the division between the scientific aspects (‘risk assessment’) and political and value aspects (‘risk management’) within the overall process of risk analysis. This division, and several other aspects of the ‘Red Book’ model, have been adopted across a wide variety of risk management fields (Omenn, 2003).
- *‘Transparent (inclusive) governance’ model.* This model is inspired by the 1996 NRC report on risk characterization in which the interface between assessment and management has been stressed and in which science, politics, economic actors and representatives of civil society are invited to play a role in both assessment and management (NRC, 1996). Of special importance in this model are the inclusion of pre-assessment (in particular, framing) and the stage of characterization and evaluation.

It is this third model of transparent governance that we have chosen for our framework on risk governance. The following chapters will guide the reader through each stage of the risk governance framework.