Protocol for Risk-Informed Governance and Communication

April 2025

This **Protocol on Risk-Informed Governance and Communication** is a publication of the Joint Committee on Structural Safety (JCSS). Its content was developed and discussed by the members of the committee. The principal editor of the document is **Ton Vrouwenvelder** (ton.vrouwenvelder@tno.nl).

Summary of objectives of the document

- Provide relevant information for all parties involved in risk assessment and decision support processes, ensuring effective communication.
- Foster a clear, shared understanding of risk-based decision support, including terminology and applied methods.
- Clarify the roles, responsibilities, and contributions of various stakeholders in the processes.
- Serve as a broadly applicable framework for various hazards, while allowing for adjustments based on national or local legal requirements.

1. Introduction

Successful societal development relies on the capacity to develop scientifically sound bases for decision making and to implement decisions with the highest possible efficiency with respect to expected effects. This also holds for decisions related to risk governance and management that must be realized to comprise a service to the citizens of society, facilitated through shared financial and natural resources.

It is well appreciated that when outcomes of decisions are associated with uncertainty – which is the common case – evidence-based risk information provides the theoretically optimal foundation for the development of decision support. In theory, the development of risk-informed decision basis may seem straightforward, however, in practice, three important challenges must be adequately addressed.

The first challenge is ensuring scientific soundness and consistency in knowledge collection, evidence retrieval, e.g. from observations and data, and risk modeling and analysis.

The second challenge is that decision-makers and stakeholders often lack expertise in risk-informed decision-making or the underlying natural and manmade processes that potentially lead to consequences. A common issue is the failure to recognize that risks from uncertain future events are equivalent to known deterministic losses or expenditures today.

The third challenge is associated with the allocation of roles, responsibilities, and liabilities of decision makers, stakeholders including the public and experts in the larger context of risk governance and management.

The present document aims to contribute to a protocol i.e. a form of "standardization" in terms of a best practice guideline on how to deal with these challenges and thereby to enhance the quality of societal decision making. More specifically, in the following the focus is directed on:

- The rationale and premises for models and terminology used when performing risk analysis (quantitatively where possible) in a consistent way in all fields of application.
- Risk management including ranking of decision alternatives, final decisions, actions, responsibilities and communication.
- Guidance and formats for risk communication between all parties involved.

Examples of possible fields of application of this protocol, parties involved, and a list of terms and definitions are given in Annexes A to C.

The document is intended for all parties involved in risk assessment and decision support processes and should stimulate mutual cooperation and understanding.

In the following, the aspects of risk analysis, management, communication and responsibilities will be elaborated.

2. Risk analysis

The identification and quantification of the risk (risk analysis) is primarily a scientific and technical activity. It starts with a description of the relevant systems and processes. An inventory of normal and deviating situations is made and health and safety, socio-economic and environmental consequences are quantified, using relevant risk metrics.

A risk analysis should contain the identification and representation of:

- relevant hazards and hazard scenarios, both in the situation with existing and with proposed additional remedial measures,
- uncertainties,
- possible consequences (as for example human life and health, economy, environment).

Risks can apply to both overall exposure and specific individuals or groups. The analysis should clearly define its purpose, scope, system, and timeframe.

A risk analysis may serve as a basis for evaluation of acceptability, for example by comparison with other risks and/or by estimating the effectiveness of remedial measures for reducing the risks in relation to the costs (or other disadvantages) of the measures. It may also serve as a basis for the identification of the relevant stakeholders.

Risk analysis models may be based on physical principles or purely statistical methods. Examples of the former include structural responses to hurricanes or earthquakes and models of natural fire development. When based on statistical methods, discrete events (e.g., sprinkler activation) can be introduced, with probabilities derived from experience.

A quantitative risk analysis may be preceded by a qualitative assessment for exploratory or screening purposes. Such a qualitative assessment identifies vulnerabilities or weak points in the system. It helps establish a common understanding of the key risks, provides a foundation for selecting relevant risk mitigation measures, and facilitates clear communication. The qualitative step may also include identifying all relevant remedial measures that could address the identified risks.

Note that risk analysis is not a goal in itself, but a tool to arrive at good decisions.

Only good cooperation between specialists in risk analysis and experts in the application domains (like engineering, ecology, or human sciences) may lead to optimal decision making.

3. Risk management

As part of risk management, the various alternatives for risk mitigation have to be compared and an optimal and acceptable choice has to be identified. The fundamental problem is usually the tradeoff between the cost of remedial interventions on the one hand, and risk reduction achieved on the other. For the consideration of life safety and societal acceptance the Willingness to Pay, the Life Quality Index or comparable approaches may prove to be relevant.

The final choice between alternatives is a political one, in particular the choice between accepting a theoretical optimum or overruling it for whatever political reason. It is at this point that the roles of the various parties must be clearly understood.

Important issues in this respect are:

- the degree of voluntariness
- psychological aspects (the feeling of safety as opposed to the technical presentation)
- the degree of proven professional controlling the risk management processes (both on the hazard, on the vulnerability, as on the consequences)
- the (ir)reversibility of damage
- the damage burden to future generations
- the reputation damage
- the loss of trust
- the difference between who profits from a risky activity and who takes what risks (including insurance options)

In practice, also less essential issues may play a role.

It is essential that experts and decision-makers reflect on the justification of their decisions, both at the time the decisions are made and later if the actual consequences differ significantly from initial estimates. Relevant questions include: Did we do enough? Did we do too much? Evaluating decisions in this way provides valuable insights for future improvements, and the outcomes should be openly communicated to stakeholders.

4. Risk communication

Risk communication includes the sharing of information between stakeholders such as experts, authorities, emergency services, and the public. Transparency should be considered here as a keyword.

Risk communication is relevant before, during, and after the decision making process; in this process a distinction should be made between:

- long-term strategic programs for the management of hazards and the reduction of possible losses (including preparedness, adaptation and capacity building);
- operational decision making concerning the management of day-to-day risks, and
- tactical decision making aimed at loss reduction just before, during and after the occurrences of possible adverse events.

The notions of existing and acceptable risks and necessary or optional safety measures need to be discussed between experts on the one hand, and stakeholders on the other.

Information communicated to the various parties should be relevant, complete as far as possible, reliable and transparent for all recipients, using understandable language and uniform terminology over the various fields of applications. Modern techniques of computer visualization could be helpful. The information shall include an overview of the hazards, the probabilities of possible scenarios, the consequences and their extent over time and space in a quantitative way; their basis and background shall be specified. Note that in this respect information symmetry is a necessity for developing and maintaining trust between all parties involved. Trust, on the other hand, is a prerequisite for proactive collaboration.

Information should include:

- Implemented remedial measures and measures considered but not implemented
- Most recent observations and their interpretation
- The estimated frequency, intensity, and duration of the anticipated events,
- The likely consequences, and their range and extent in time and space,
- A list of societal functions that are likely to be lost and for how long,
- The rationale underlying societal management of risks, including why risks can never be completely mitigated, why losses cannot be fully avoided, and why the collaboration between stakeholders is essential,
- Which are the institutions, authorities, and private stakeholders that are responsible for managing risks and liable for their conduct in this respect,
- Public protection measures and evacuation plans, required and recommended,
- What can different groups of stakeholders do themselves to reduce risks, before, during, and after events,
- Ways to get further detailed information or help,
- What to do when the event is over.

However the 'need or opportunity to know' may depend on the responsibilities of the addressed party.

Authorities are responsible for the communication of the decisions made. They may ask experts to assist in explaining the background. Direct contact between experts and the media usually will be done only after consulting the responsible authority, if any. This rule may be violated only in exceptional cases.

Finally, after a disaster, it is important to give an official account of what happened, why it could happen, and what lessons to draw. The public should be informed about the extent of the consequences, why the disaster and the losses could happen, and what can be learned. Will it lead to a change in priorities and, if not, why?

5. Responsibilities

For all aspects, intense cooperation between the various parties is needed to achieve technically sound and clear decisions. As such, all parties are obliged to give an adequate

contribution and to not withhold any possibly relevant information.

Although good cooperation between all parties and for all aspects is expected, there should be a clear understanding of the main responsibilities:

- The technical/scientific experts in the sense of the Hippocratic Oath have the responsibility to provide technical knowledge based on their best expertise and experience and/or present a risk analysis including options for remedial measures, based on well-established up to date methods and information. This holds regardless of the position and role of the expert in the context of stakeholders.
- The technical/scientific experts shall provide their expertise in accordance with the best available knowledge, and not necessarily restricted to present practice, if this is less advanced with respect to what is available and practically possible and feasible. Higher levels of the organizational hierarchy or any stakeholder shall not mandate technical and scientific experts to provide specific information
- Finally, the technical/scientific experts, like any other civil person receiving/acquiring information about situations associated with potentially excessive risks to people and assets, have the obligation to take adequate and timely action. Such action typically involves informing stakeholders at risk (if these are imminent), informing the responsible decision maker.

Any stakeholder, relevant public services, private companies, and the public, is responsible for providing correct and relevant information and carrying out tasks in accordance with the formal decisions.

The relevant authorities are responsible for the final choice of which measures to take, the corresponding acceptable risk levels, and the communication of appropriate information to all stakeholders. Note that the various stakeholders may have different or even conflicting interests, and these should be openly disclosed and discussed. In some cases, it may require a judgement by a legal court.

Authorities are always responsible for the communication of the decisions made. They may ask experts to assist in explaining the background. Non-conformance with this rule is justified only in cases where better knowledge of experts or other stakeholders demands so.

The responsibilities for the risks analysis and management may be held by a delegated well-constituted entity that can consist of public authorities, emergency services, technical experts, and other stakeholders. The membership and remit of this entity may depend on, for example, the types of hazards and their potential consequences, the complexity of the project, and the innovative nature of the work involved.

Final note: Due to the underlying and unavoidable uncertainties, the quality of technical advice concerning risk cannot be judged on the success of predicting events or avoiding losses, but only on the quality of the underlying probabilistic/statistical analyses and risk assessments at the time the advice was given.

Summary

This document is intended as a draft protocol on how parties involved in risk-informed risk governance and communication should deal with the decision making process related

to management of hazards, mitigation of their consequences, and corresponding responsibilities and communication. The set up has been kept independent from the field of application. The idea is to formulate a set of generally applicable rules with the aim to foster understanding between the various parties involved (decision makers, experts, public etc.) in terms of terminology, methods of analysis, and operational procedures involved in the governance of risk management and communication.

Relevant references

- Hadden S.G., *A Citizens' Right to Know: Risk Communication and Public Policy*, ISBN 9780367153410, Routledge, 2023
- IRIS (Integrated European Industrial Risk Reduction System), Final Report Summary, CORDIS, https://cordis.europa.eu/project/id/213968/reporting, 2012
- Robert Meyer & Howard Kunreuther, *The Ostrich Paradox*, https://whr.tn/320EU9I
- Faber M., *Bayesian Modeling in Civil Engineering*, YouTube, Learning Bayesian Statistics, December 2023
- Vrouwenvelder A., Holicky M., Tanner P., Lovegrove D. and Canisius G. (2001), Risk assessment and risk communication in civil engineering, CIB Report Publication 254, Rotterdam, 2001
- Jordi Prats, The l'Aquila earthquake, science or risk on trial, The Royal Statistical Society, 2012
- Faber M. and N. Lind, Protocol for risk communication, OECD High Level Risk Forum, 2013
- Faber M. and N. Lind, Rationale for the management of life safety risks, OECD High Level Risk Forum, 2013
- Faber M., Vrouwenvelder A. and Lind N. (2015), Protocols for communication and governance of risks, 12th ICASP, Vancouver BC.

Annexes

Annex A Fields of application of the protocol (examples)

- hurricanes
- flood
- earthquake
- explosion
- fire
- transportation accidents
- toxic releases
- viruses
- contamination of food

Annex B List of possible parties (stakeholders) involved (further detailing necessary per case)

- technical experts, professionals
- public officials
- authorities (policy makers)
- emergency services
- companies, industry
- psychologists, communication experts
- lawyers / legal institutes
- public
- press

Annex C Terms and definitions

Intended recipient(s)
Decision maker, usually a government or other authority. It can also be a company or companies, addressed to the executive.

Hazard
A natural or manmade threat, having the potential to cause negative consequences (losses) to society; all possible hazards and interactions between hazards shall be identified and described in sufficient detail.

Scenario
A sequence of events, mechanisms and remedial measures leading to a loss

Consequences
A clearly specified and preferably complete set of the possible losses caused by the

occurrence of a scenario. If there are some scenarios and possible losses that are not considered they shall also be stated.

Extent
A geographic area, jurisdiction or set of persons exposed to the hazard, together with the period of time considered.

Uncertainty
Common notion of all kinds of unpredictability, inaccuracy or doubt related to the occurrence of events, the outcome of models or values of quantities; uncertainties may be of an aleatory (natural) or epistemic (human knowledge) nature; both types should be considered

Probability estimate
Numerical values assigned to (estimated for) the probability of occurrence of an uncertain element in the analysis.

Risk
For each individual scenario the risk is the expected consequence, that is the product of the consequences of a scenario and its probability of occurrence. The total risk is the sum of the risks determined per scenario, provided that the scenarios are exclusive.