Edited by R. F. Hertel, G. Henseler

ERiK – Development of a multi-stage risk communication process

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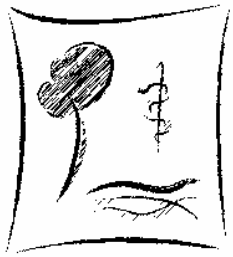
Action Programme “Environment and Health”



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Preface

Since 1992 various expert bodies, which have advised the Federal Government in recent years, as well as scientific circles have been calling for risk communication to be integrated into regulatory practice and intensified. Risk communication is seen as a major cross-sectional task of all institutions involved in the assessment and management of risks.

In 2002 the OECD published the "Guidance Document on Risk Communication for Chemical Risk Management" which had been developed under the aegis of the then BgVV (Federal Institute for Consumer Health Protection and Veterinary Medicine). A research project within the framework of the Federal Government's Action Programme Environment and Health was given the task of evaluating the findings of this OECD project for implementation in Germany. Tools were to be developed to improve communication amongst and with all stakeholders in the risk management process. Measures were also to be elaborated to build up and encourage the trust of the general public in regulatory agencies and their procedures.

To this end, a multi-stage risk communication process was developed in which risk communication is seen as a targeted exchange of information between political institutions, companies, associations, representatives of Civil Society, scientists, experts, individuals and the media. In this context, the exchange of information focuses on the harmful potential of the risk, the remaining uncertainties, the importance of the risk as well as political and social decisions, actions or measures aiming to avoid, reduce and regulate risks. Risk communication has the task of establishing links with communication partners by explaining and presenting arguments. This is not possible without mutual communication. The goal is not to convince the other side that a risk is acceptable or unacceptable bur rather to enable those concerned to assert their right to freedom of choice through information offerings (one-way communication), dialogue (two-way communication) or through an invitation to active involvement (opportunity to participate in the preparation and taking of decisions).

This report is primarily intended for the management of senior federal agencies or the competent persons in the respective departments. Risk communication must be solidly anchored in the new, contemporary philosophy of public agencies. It should not be perceived as a bothersome, additional burden but rather recognised and esteemed as a proven, sought-after means for fulfilling duties for the population at large. Against this backdrop risk communication can be used proactively for consumer protection purposes. In order to achieve this goal, this report also makes recommendations on organisational preconditions and suitable procedures.

For the purpose of practical tests a CD training programme on risk communication has been developed and attached to this report. It is intended for the staff of public agencies on the federal government, federal state and regional levels who are responsible for risk regulation and who should communicate with experts, politicians, representatives of other public agencies, social organisations, industry, associations, the media or the general public.

This training programme intends to raise your awareness of the need for risk communication, to familiarise you with the opportunities and risks of risk communication, to give you tips for the orientation of risk communication in your public agency, to inform you about proven risk communication tools and, last but not least, to awaken your interest in the independent use of risk communication.

Professor Dr. Dr. Andreas Hensel
President of the Federal Institute for Risk Assessment

1 Introduction

1.1 The Project

Many people have great difficulty in assessing risks to health and the environment in a complex, integrated world. They are confronted with a flood of frequently contradictory media reports; they observe largely inconsistent reactions to real and alleged scandals; in many cases they are either overtaxed or "talked down to" in official expert opinions on risks. In a nutshell most people are uneasy when environmental and health risks are discussed.

A number of official documents like the Action Programme Environment and Health (APUG) (1999), the 1998 opinion of the Advisory Council on the Environment (SRU) as well as the interim (2002) and final (2003) reports of the Risk Commission all stress that there are deficits in the field of risk communication. Topics like the impact of contaminants in air, water, soil and foods, the consequences of exposure to ionising or non-ionising rays, the effects of chemicals and the consequences of biological risks, e.g. acute pathogens, have attracted considerable public attention. However, communication practice does not do justice to the need for factual, balanced and judgement-enhancing communication.

These deficits have to do with both the conceptual orientation of risk communication as well as aspects of its implementation and translation into state action. Many public agencies and state institutions use different yardsticks to assess risks and this leads to varying limit values and deviating strategies. Effective risk regulation is thus impeded. Consequently, public agencies lose credibility in the public's eyes.

In order to remedy the situation the Federal Ministry for the Environment and the Federal Ministry for Health have formulated a number of points and tasks for the implementation of APUG in Part I "Goals and Cross-functional Measures" of the Action Programme Environment and Health (APUG) approved in June 1999. They include the "development of active, timely risk communication". In line with the APUG objectives, risk communication is to concentrate on improving public understanding of environmental and health policy decision-making as well as the practicable opportunities for inputting the experience and values of all the players into the decision-making processes. Other important aspects like the timely involvement of citizens, improvements to the transparency of the decision-making process and an understandable, plausible way of setting standards are also mentioned there [APUG 1999].

Project goals
During the concretisation of these goals, the project "Development of a Multi-stage Risk Communication Method (ERiK)" was launched on behalf of the Federal Environmental Agency (UBA) under the direction of the Federal Institute for Consumer Health Protection and Veterinary Medicine (BgVV) – now Federal Institute for Risk Assessment (BfR). This project seeks to develop a model of participative risk communication which meets the expectations and demands of the various federal agencies and those of the target groups of communication. Furthermore, this model should be designed in such a way that it can be used for practical communication between different players, e.g. manufacturers, consumers, media representatives and public agency staff. This requires the specification of requirements, tasks and responsibilities as well as the provision of methods. In order to effectively achieve this goal, the report also presents recommendations on suitable organisational preconditions and processes. For practical trials, a CD training programme on risk communication has been developed and attached, which is intended for:

- the staff of public agencies on the federal government, federal state and regional levels;
- who bear responsibility in the field of regulation and

- are to communicate with experts, politicians, representatives of other public agencies, social organisations, industry, associations, the media or the public at large.

This training programme intends

- to raise awareness for the need for risk communication,
- to familiarise the readers with the opportunities and risks of risk communication,
- to give practical tips on how to develop risk communication in your public agency,
- to inform readers about tried-and-tested tools of risk communication and
- to encourage all risk communicators to undertake independent risk communication.

In addition, a practical training programme for public agency staff on implementing the risk communication model has been devised and assistance is given in drawing up assessment programmes.

Addressees of the report
This report is primarily intended for the management of senior federal agencies and the competent staff in the respective departments. Risk communication must be solidly anchored in the new, contemporary philosophy of public agencies. It should not be perceived as a bothersome, additional burden but rather recognised and valued as an effective, sought-after means for fulfilling duties for the population at large. Risk communication can then also be used as a means of active consumer protection.

Focus of the report
This report encompasses background information and instructions on the three main topics:

- Improving forms and practices of communication within the regulatory agencies and between the public agencies, external groups and individuals;
- Characterising the special requirements to be met by communication in conjunction with the topic risk and risk regulation;
- Opportunities, experiences and instructions on the subject of involving the public at large in the decision-making process behind risk regulation.

Structure of the report
These three topics are addressed in each chapter of the report. The first part (Chapters 1 and 2) of the report provides information on a better understanding of the starting situation and the functions of risk communication in a pluralist society. The second part (Chapters 3 to 6) presents four scenarios which reflect different communication situations. Here the spectrum ranges from technical discussions within a public agency down to innovative ways of involving the public at large in decisions on risk-reducing measures. One entire chapter (Chapter 7) is dedicated to risk comparisons as comparisons of this kind are often essential in communication. Frequently, however, they have a tendency to cause havoc in practice rather than increase understanding. The report concludes with a chapter on evaluation methods for the assessment of communication projects and a general outlook. Some references and Internet links are listed at the end of each chapter which give the interested reader access to more comprehensive information, case studies or instructions.

Virtual training programme
A PC-aided virtual training programme is attached to this report. It is intended for examination of the most important instructions and recommendations to be borne in mind when communicating about risks. This training programme focuses on scenarios 1 and 2. The necessary steps of learning and practice in the case of the more complex scenarios 3 and 4 would be more suited to group work under the guidance of an experienced moderator. Chapter 8 contains some comments on this.

1.2 Why risk communication?

Risk judgement sovereignty
In democratic societies citizens expect decisions that affect their lives and health to be publicly legitimised. This is not possible without interactive communication. The goal is not to merely convince the other side that a risk is acceptable or unacceptable but rather to enable those concerned to stake their claim to risk judgement capacity through corresponding information offerings (one-way communication), dialogue (two-way communication) and participation (opportunity to take part in the preparation and taking of decisions). The term "risk judgement sovereignty" means the ability, based on knowledge of the factually proven consequences of risk-bringing events or activities, the remaining uncertainties and other relevant risk factors, to undertake a personal assessment of the risks which corresponds to one's own criteria or to the ethical criteria deemed appropriate for society. When recognising people's risk judgement capacity, it is the task of the risk-regulating agencies to build up and maintain the necessary communication base. In this context the different forms of communication ranging from information to participation should be seen as a continuum of growing intensity and reciprocally in the relations between the communication partners.

The way in which risks are assessed by politicians and experts is just as important for successful communication as the question about the best form, the suitable structure or the communication process model used. Packaging is important but the best packaging is of no use whatsoever if the content has no value.

1.3 General functions of risk communication

Open process
Risk communication must be understood as an open process of the mutual comparison of information and arguments. Here, risk communication has the following tasks:

- factual information on progress in scientific research into the effects and side-effects of incidents, substances and activities on the environment and health;
- co-ordination of the players amongst themselves as well as informing the population concerned about possible protective measures and behavioural adjustments (including communication-based preparation for emergency measures);
- comprehensive information on the methods of evaluation and assessment of risks (and benefits) used;
- clarification of the points of view of the interest groups concerned;
- the provision and conducting of communicative processes for problem-driven and democratically organised involvement of the various players in the risk assessment process.

The fulfilling of these five risk communication functions must be seen as a central task by the risk assessment and management institutions. This applies to both the public and private sector.

Handling dissent
Nevertheless, the impression should also be avoided here that it was all just a matter of communicating risks "in the right manner" and then any dissent would disappear. In principle consensus is possible and desirable in most cases. However, when it comes to elaborating risk communication processes, creation of consensus or acceptance tends to take a back seat. What is far more important is clarification of the situations, circumstances or framework condition responsible for the different attitudes and assessments. Risk communication rarely overcomes dissent but it does create a rational foundation for identifying and demarcating dissent and, by extension, in dealing with it more effectively.

It is not the task of risk communication to ignore or even standardise ambivalences in society but rather to contribute, by means of proven tools, to maintaining society's ability to take action despite differing prevailing preferences.

1.4 Risk communication in an environment with different players

Pluralistic values
In a society with pluralistic values where political actions are always subject to considerable legitimisation pressure, risk assessments may face widespread scepticism and deep mistrust. Statements on risks are dependant more than other statements on plausibility (i.e. intuitively mediated understanding of the thought processes) and trust in the regulatory agencies. Hence, risk communication can only succeed in an intensive, understanding-oriented dialogue with the players and the interested public at large.

Risk communication levels
Ideally, risk communication takes place on several different levels. These levels encompass a number of players like experts, regulatory staff, politicians, representatives of other public agencies, social groups, industry, associations, the media, the stakeholders in the population and multipliers. Risk communication also takes place between the different political levels in environmental, health and consumer protection policy (communities, regions, federal government, Europe). On all these levels of risk communication there are frequently misunderstandings, misinterpretations and conflicts. Furthermore, the communication process is not to be seen in a one-sided manner. Very often the people affected by risks can also provide important information for scientific risk analysis and risk management. For that reason care should be taken to ensure a broadly based, mutual exchange of information tailored to the addressees.

Fig. 1: Horizontal and vertical risk communication

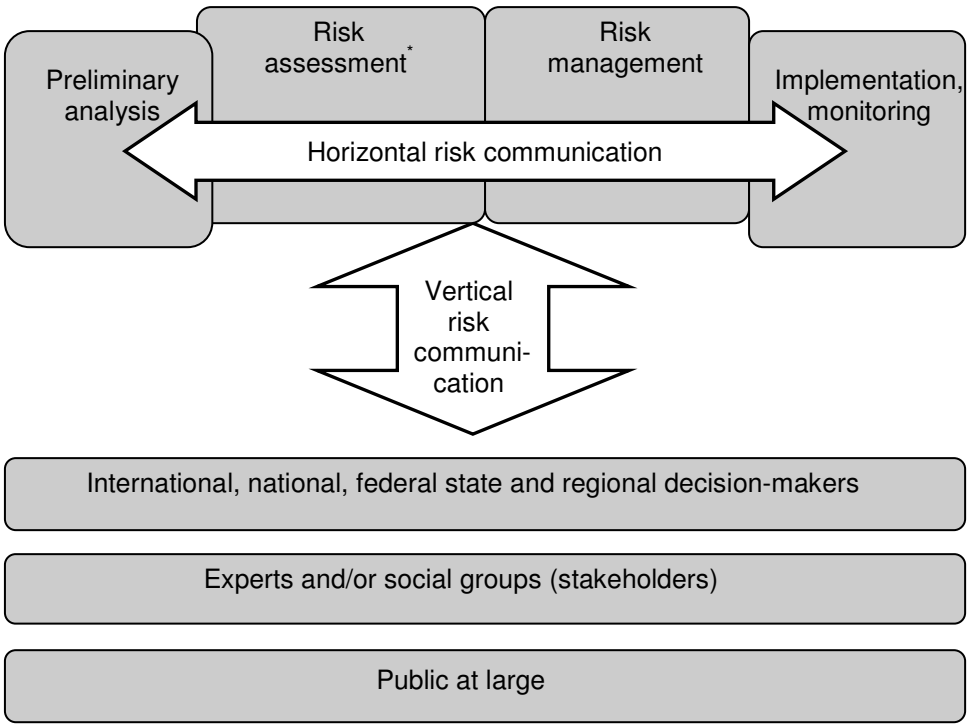

Figure 1 shows the various levels of risk communication. A distinction is made between horizontal and vertical communication depending on the degree to which risk communication is oriented towards the regulatory process (from the preliminary analysis down to monitoring). Within the risk regulation process horizontal risk communication has the cross-sectional task of creating viable interfaces for securing the integration of the results from the phases: preliminary analysis, risk assessment, risk management, implementation of measures and controls and for moving the process forward in this way.

Vertical risk communication permits the integration of the arguments and preferences of people and institutions outside the actual regulation process. The involvement of the people concerned in decisions in a climate of uncertainty means that social preferences and values can be carried over into the process of weighing up the conflicting goals. Only in this way can the decision-making process in a pluralistic society secure its political legitimisation.

Besides communication with stakeholders, the general public must also be involved in a suitable manner. First of all statutory obligations concerning the involvement of the public at large must be respected; furthermore new forms of public participation can also be used. Here risk communication has the task of presenting the procedures, arguments, reasons and results of all phases of the regulatory process in a plausible manner and of giving adequate consideration to the concerns of the groups in the population affected.

1.5 Requirements to be met by the risk communication process

How can the demand for the wide, addressee-oriented, mutual exchange of information be implemented in reality?

Successful risk communication implies a rationally thought-through, *factual* process of risk assessment which reflects the pluralistic values of society. For that reason special attention should be paid to *plausible*, consistent risk assessment methods that reflect people's concerns. As existing attitudes and convictions are frequently entrenched and influence the processing of new information, efforts should be made to achieve if possible timely, *active and ongoing* communication.

This type of comprehensive communication includes:

- clear, timely and plausible documentation of all assessment processes and results with information on the assessment methods and criteria used as well as on their factual and statutory bases;
- information on how comments and tips from third parties are taken over and processed;
- information on participation and objection opportunities;
- opening of a communication channel for feedback and commentaries;
- information about public events or dialogues on the risk concerned;
- information on the relevant literature and other expert opinions.

Uniform use of terms
When communicating with the players and the public at large, one important goal is to achieve understanding on the basis of known terms and concepts that are familiar to everyone involved. The central terms and concepts of risk assessment, evaluation and risk management should, wherever possible and legally admissible, be used for all external communication. It is particularly important that the terms and concepts clearly explain the degree of hazard, the overall context and the respective good to be protected. Whenever terms are to

be used differently, an explanation of these differences should be given. For instance if the term "limit value" or “standard” has different meanings in different contexts then confusion and irritation are unavoidable. It should be made clear to the addressees that for formal, legal or contextual reasons, there has been a deviation from customary language use which is then, however, explained.

Explanations of the key terms used are the first step towards achieving addressee-oriented processing of the material. Furthermore, risks must be presented in the overall context of risk-benefit analyses and the possibility of containing other risks by assuming a specific risk so as to position the risk and risk-containing measures in the overall context of the respective activity.

No pressure for harmony of interests
As already outlined in Chapter 1.3, even the very best communication comes up against boundaries. Even if there is a real understanding of a factual issue, this does not necessarily mean that the interests are also the same. The interests behind factual situations may be revealed through communication. Risk communication should not, therefore, be expected to promote or even impose a harmony of interests. It should focus more on giving all those concerned an unbiased assessment of the risks that corresponds to their own values.

1.6 Institutional requirements

Risk communication cannot be dealt with as an aside. It needs to be an integral part of work in the institutions involved in risk assessment or evaluation. This includes:

Organisational anchoring
The anchoring of risk communication in the risk assessment and management institutions and the recruitment of risk communication experts onto a team of risk assessors and managers.

Interface public relations
A clear interface between risk communication and the public relations department. Tasks may be assigned to a department without merging areas of activity or they can, if necessary, be assigned to two separate organisational units; in this case, however, close co-operation must be ensured.

Responsibilities
Appointment of a communication officer within each scientific department who also ensures the institutionalised links to the organisational unit for risk communication. Ideally, the person selected as the communication offer should have proven communication skills.

Training
Training of the communication officers and all staff who carry out communication tasks (in all aspects of risk communication and staff motivation aiming to improve their communication skills).

Continuing training
Besides the risk communication experts, the willing and able experts responsible for scientific risk assessment as well as risk managers must be taught the communication skills needed to exchange their procedures and results with each other and with the other actors involved and then to present them to the public at large in a comprehensible and plausible manner. It is, therefore, recommended that regular initial and continuing training courses and exercises be organised. Above all the task of communication must be classified as an important, career-enhancing activity.

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2 Conflict management and risk communication

Daily conflicts
When people talk about conflicts in day-to-day language, what they generally mean is that someone wants something that is contrary to what someone else wants or is already doing. The characteristic feature of day-to-day conflicts is when people have diverging ideas about behaviours, activities or assessments of circumstances that can have a concrete impact on their actions. Simple differences of opinion are not necessarily a conflict. Conflicts in society are normal. Avoiding conflicts means weakening the drive for innovation and development in a society. However, conflicts become social problems when the affected parties do not succeed in resolving them in a constructive manner. Here it makes sense to differentiate between personal and institutional conflicts. Personal conflicts are between individuals, institutional ones between organisations or groups of people. When it comes to risk communication, it is mainly institutional conflicts that are of primary importance.

Institutional conflicts
Institutional conflicts are normally triggered by distribution problems of scarce resources or by collectively binding rules which are targeted at people's behaviour. The special achievement of democratic societies is that they have established procedures anchored in institutions for dealing with distribution problems for reaching a compromise based on a system that is seen as fair or is negotiated. Collectively binding specifications are hence publicly legitimised. After a debate on the various management options an appointed body decides on the basis of due process rules (for instance the majority principle). Hence, conflict resolution is undertaken on the basis of previously established rules within the framework of material laws. In this way orientation, compliance with rules and equality before the law are ensured. In conjunction with the power monopoly of a state conflict resolution loses the character of an arbitrary or random form of dispute.

Causes of conflicts
The acceptance of collectively binding rules as well as the resulting negotiated compromise formulae for resolving distribution conflicts have come under increasing legitimisation pressure recently. Firstly, what can increasingly be observed is the growing tendency for the institutions and citizens concerned to reject legal policies. The fact that a decision has been taken democratically is no longer enough to secure acceptance by the stakeholders. Furthermore, citizens call for transparency when it comes to the arguments and conflicts that led to the decision. This is where risk communication can make a viable contribution. More particularly, people are no longer willing to accept burdens in their environment particularly when the beneficiaries and risk bearers are not the same.

Secondly, observers of the political system have noted a growing overtaxing of politicians and administrative staff in the face of the complexity and the degree of differentiation of the knowledge needed to take decisions. Already today politicians and administrative staff seek the advice of an infinite number of committees and boards.

Thirdly, professional politicians are increasingly losing track of their roots and are thus dependent on new processes for feedback on the values and interests of the "woman or man in the street" to political circles. The traditional forms of feedback (opinion polls or personal contacts) have proved to be inadequate or sometimes even misleading in political practice. After all the customary forms of lobbying are increasingly being dominated by organisations which increasingly represent only partial interests of society. For all these reasons it is necessary and desirable to introduce new elements into the legal forms of conflict resolution.

2.1 Conflicts and their management

Opportunities for conflict management
Firstly it is helpful to open up conflicts which seem to be restricted to yes-no alternatives to new options between the two extremes. Conflicts which only admit winners and losers are more difficult to deal with than those where there are a number of interim solutions. The sociologist Hirschman has described these two types of conflicts as divisible and indivisible conflicts. One important strategy of politics must be to transform potentially indivisible conflicts into divisible ones by creating new options. If potential losers have the impression that they have been able to push through at least some of their points, then acceptance of political decisions is far more likely.

Make learning processes possible
Secondly it's important to involve the conflict parties earlier on in the decision-making process. This is not just about competition with democratically structured decision-making bodies but far more about enhancing the decision-making process by adding new forms of participation and mediation. It is the very professionalisation of politics that has made understanding of conflict solutions, needed for their acceptance, increasingly difficult. At the same time, distrust in political generalists in individual areas of life (for instance environment, health or education) has increased. Citizens action groups challenge what are, in their opinion, unnecessary and harmful changes to their environment or question the rationality and fairness of decisions (particularly in the areas of the environment and health). This stripping of legitimisation cannot be talked down by merely referring to the mentality of “not in my backyard”. What is behind this process is far more the justified concern that when weighing up political alternatives immediate communal or regional concerns are forced to take a back seat. For that reason it is desirable and logical to include the representatives of the conflict parties in the decision making process. This gives people an opportunity to express their concerns and ideas early on and to get to know and discuss the counter-arguments. Traditional hearings take place too late in the decision-making process to be able to provide any major iincentive along the lines of new options or variations. Given their rigid structure (the panel on one side, the people raising the objections on the other) they are often characterised by ritual forms of conflict management in which there can be no social learning process for either side. Innovative methods like citizens’ fora, citizens’ committees, consensus conferences or other forms of involvement in which the parties to the conflict work towards achieving a solution together and not apart are far more effective (cf. Communication Scenario 4). This is not just about choosing an acceptable political option but above all about practising argumentation and negotiating processes which are a substantial component in social learning. Processes of social learning and the timely involvement of citizens in the development of decision-making bases are being developed and tested today in many parts of Germany and elsewhere.

Acceptance through fairness
Thirdly, acceptance of political decisions depends on the transparency of the decision-making process itself. In democratic systems most people accept even unpopular decisions if they are convinced that their arguments have been given a fair hearing and the decision-making process has been conducted according to the best of the participants’ knowledge and belief. When dealing with broader conflicts, it is necessary not only to present the results of political deliberations but also to communicate the arguments, counter-arguments and judgements. In a media landscape in which political news is reduced to sound bite size, this task is very difficult. New forms of communication must be identified and tested. For instance the Internet could be used as a political forum for the exchange of arguments. Meeting places for direct encounters between politicians and citizens could be extended, visits to political organisations stepped up and an active exchange of staff between industry, science and politics encouraged.

Facilitating encounters
Democratic conflict management can only succeed in the long-term if the distance between the people taking the decisions and the people affected by them is reduced. Some of this distance could be reduced by involving citizens in political tasks, a growing commitment of citizens to community tasks and an effective public exchange of experience between politicians and other areas of life.

2.2 Conflict management in risk assessment

Stakeholder involvement
How can the previously mentioned conflict management principles be carried over into risk communication? Where there is uncertainty and considerable conflict potential in respect of the risks to be dealt with, representatives of the groups concerned should be actively involved in the weighing up and decision-making processes alongside the direct players. The involvement of the players in risk assessment and risk management should not be reduced to a one-sided exchange of information. After all normative assumptions and values, albeit to varying degrees, are also taken over into the process of risk assessment and management. Above all the definition and interpretation of safety, the laying down of conventions for evaluation as well as the selection and weighing up of risk-reducing measures are determined by social and political goals. To that extent the appropriate involvement of social players in decision-making is justified and makes democratic sense. The participation methods for the players should be available on three levels:

Involve the experts
Within the framework of the preliminary analysis (this encompasses the elements: determining the protection goals, early detection, decision on short-term needs for action and setting of priorities) and risk assessment, the various knowledge bearers from different disciplines and institutions must work together in order to come to a balanced evaluation. For this innovative methods like expert workshops, Delphi surveys, scientific consensus conferences amongst others are well suited (see Scenario 2).

Involve the stakeholders
Representatives of the stakeholders must be involved in the weighing up of risks particularly when the impact is unsure. This can take the form of traditional hearings and citizens' assemblies but also new forms like mediation and round tables. The results of the weighing up phase must be presented at a hearing and the stakeholders must be given an opportunity to comment on them (see Scenario 3).

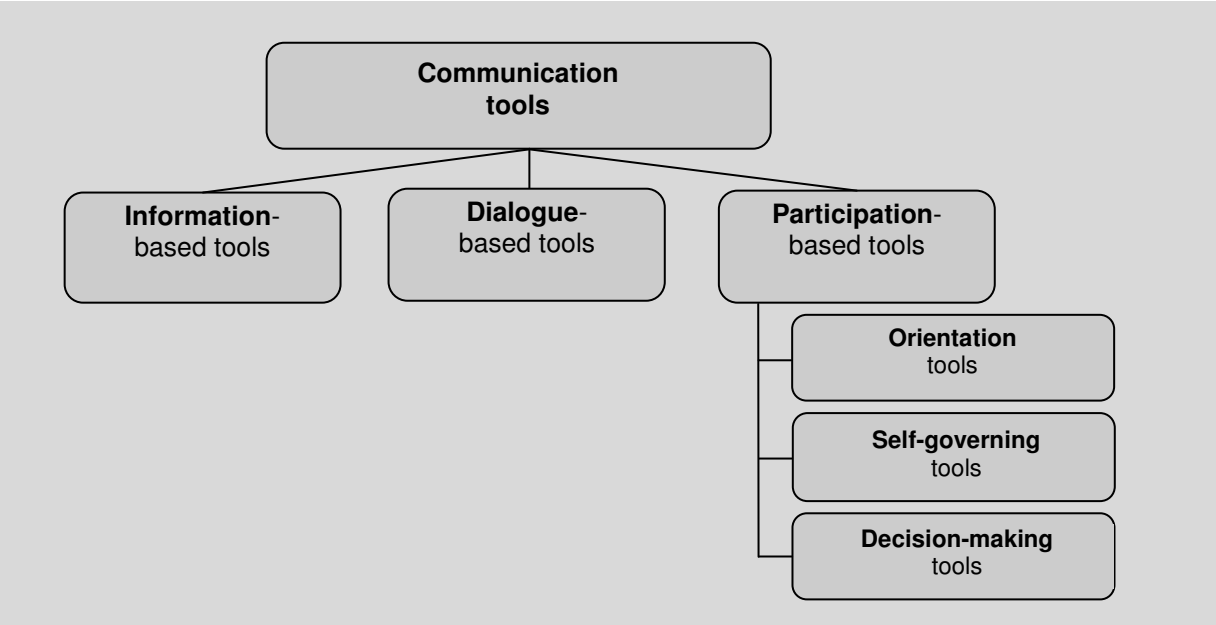
Involve the population
In the case of controversial risk issues the population concerned should be involved in the implementation of risk-reducing measures. Traditional methods like hearings and citizens' assemblies as well as innovative methods like citizens' fora, planning cells or consensus conferences should be selected (see Scenario 4).

Take outsiders into account
In addition to these participation methods, there must be more dialogue-based procedures for communication and for informing the interested groups and individuals. In this context decentralised public fora, joint network activities and other dialogue-driven events (for instance panel discussions, talk shows, excursions, etc.) make sense. Furthermore, the setting up of a clearing house for public risk debate on the Internet would be a helpful tool in order to ensure factual communication that also reflects the concerns of the population.

2.3 Communication and conflict management tools

Which tools can be assigned to communicative and dialogue-driven procedures? There are three basic types of communication tools:

Fig. 2: Communication tools



One-way communication
Information-based tools: This encompasses all forms of communication oriented towards the communicating body informing the target group(s). Feedback or two-way communication is not envisaged. This type of communication should be selected when the group of addressees is very big and communication can be ensured through the mere transmission of information. Frequently information-based tools are suitable for the preparation or later processing of dialogue or participation-based tools. The information-based tools include brochures and other written material, newspapers, classical PR (press releases, radio interviews), websites, events, incidents, events etc.

Two-way communication
Dialogue-based tools include two-way communication with the addressees of communication without the addressees, however, being given the opportunity to play an active role in the design, assessment or implementation of decisions and measures. Dialogue is, therefore, restricted to questions and answers, explanations and questions, the sounding out of opinions and judgements as well as reciprocal information. Dialogue-based tools include brochures with a return coupon, opinion polls, lectures, panel discussions, discussion rounds, Internet with feedback, chat-rooms, dialogue-based events, open days.

The participation-based tools differ from the dialogue procedures in that they directly or indirectly integrate the concerns of the addressees into the decision-making process. Here the boundary line between dialogue and participation is often fluid. The participation methods can be classified in three groups:

Generating ideas and orientation
The orientation tools are designed to allow the groups concerned to help orient decision-makers without them having any direct influence on them. The goal of orientation is for decision-makers to get to know and understand the concerns of the groups. Furthermore, some tools aim to discuss joint options with the group representatives and to reflect together on the advantages and disadvantages of each option. Orientation tools include hearings, non-binding round tables, citizens' assemblies, open space conferences and focus groups.

Self-commitment and self-governance
These tools are about co-ordinating actions which are carried out and implemented by the players themselves. The political decision-makers may provide stimulus or an organisational platform for this discourse. For instance measures may emerge which are in the interests of both groups. The self-governance tools include working groups, future workshops, open space conferences (also suitable for orientation discourses), player-driven round tables.

Recommend a decision
The decision-making tools involve the concrete preparation of a political (i.e. collectively binding) decision in the form of management recommendations or the decision itself. Discourses of this kind are appropriate when specific groups or representatives of the general public are to be directly involved in the decision-making process. In some cases participation of this kind is a stipulated by law or is used consciously by political decision-makers in order to take the concerns of those affected by the decision into account and to secure a positive response from them to the decision. These tools include for instance weight-carrying round tables, co-operative planning rounds, citizens' fora, consensus conferences and mediation (in the case of conflicts).

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3 A risk communication model

3.1 Requirements to be met by a risk communication model

What is the point of a model?
A model is a value-driven image of a desired condition. Models normally assume largely orientational, co-ordinating and motivating functions by seeking to clearly illustrate and anticipate a desired development. A model presents the first image of what is desired and the path to achieving it. Whether the target condition can actually be achieved, depends both on the feasibility and desirability of the model itself as well as on political, social and economic factors. It should be oriented as closely as possible to the current situation in order to demonstrate its viability to all those concerned. On the other hand, it should also be oriented towards the target state in order to highlight the attractiveness of the new reality. At the same time, a model should be consistent and create incentives so that the players identify with it and are motivated. If this succeeds, a number of goals can be achieved:

Functions of models

- Models may encourage the creativity of the players.
- Models may change the perception of the players and make them aware of new priorities within their own institutions.
- Models may improve the "working atmosphere" by providing orientation.
- Models have the potential to influence future reality by means of depicting the desired state ("self-fulfilling prophecy").
- Models enable players, despite the "demands of daily business" to establish their priorities in such a way that they can achieve the desired goals in the long-term.

Each scenario has its own model
The general functions presented must be backed by specific requirements. In the ERiK project, a model has been formulated for each scenario. Here experiences from the past, estimates of strength and weaknesses as well as overall future societal trends were taken into account. The models formulated below present the first results on how they were elaborated within the framework of the ERiK project in co-operation with an ad hoc group.

They are merely intended as an orientation and encouragement for other institutions to develop their own models. The intention is certainly not to simply impose the models presented on other institutions.

3.2 Requirements to be met by risk communication guidelines

Models alone are not enough in order to achieve improved risk communication in practice. The model has to be concretised by means of guidelines. Guidelines of this kind can be understood as a tangible form of the model. They offer concrete assistance for evaluation and actions in the situations specified therein. At the same time, guidelines are an important element of quality assurance and quality management by means of which the success of risk communication can be measured. They may also serve as the foundation for initial and continuing training programmes. Guidelines should be scientifically based but also be player-oriented and viable. They encourage the more effective shaping of communication within the framework of different situational requirements.

3.3 Communication in the scenarios

Why these scenarios?
For the ERiK project four ideal scenarios were drawn up from the broad range of communication situations that best correspond to the communication requirements of federal risk handling agencies. These scenarios were elaborated in co-operation with the research project co-ordinators and classified by the ad hoc working group as relevant for the communication tasks of the federal or also state agencies. The scenarios are mainly shaped by their specific players, their related concerns and the available resources. The scenarios also contain forms of communication which go beyond risk communication in the narrower sense. Crisis communication and classical PR and press work were consciously excluded from the ERiK project. That is why no scenarios were developed for these two purposes. The four scenarios are called:

Scenario 1 (Public agency communication):
"Communication between the risk analysts within a public agency and between agencies or between risk analysts and risk managers“

Scenario 2 (Expert communication):
"Communication between public agency risk analysts and external scientists or experts"

Scenario 3 (Stakeholder communication):
"Communication between public agency risk analysts and stakeholders“

Scenario 4 (Communication with the general public):
"Communication between public agency risk analysts and the public at large“

The communication steps in the four scenarios can only be presented in an idealised and rough manner. These are basic procedures; they are not highly detailed descriptions of actual communication steps. The example "EU Risk Assessment Report 4.4 Methyl dianiline (MDA)” demonstrates just how complicated this can be in individual cases. Fig. 5 shows which steps have to be taken on the path from the identified need for examination down to the presentation of an "EU Risk Reduction Strategy“. What is noticeable here is that the process which takes roughly five years is based on a large number of not only internal but also external communication steps. In this context oral and written, internal (here "orientational talks") expert group or multi-disciplinary expert group procedures are used. There is a complex communication structure with different areas of responsibility and decision-making competences.

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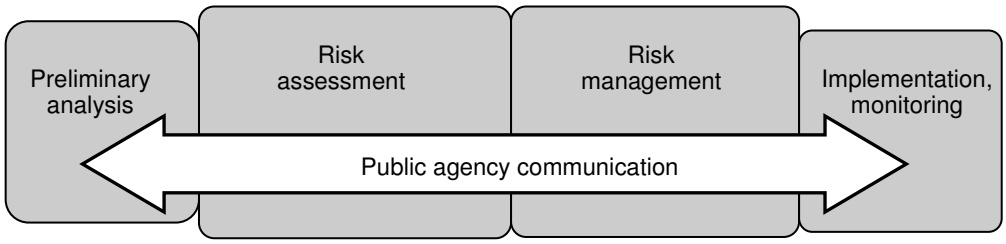
4 Scenario 1 (Public agency communication) and 2 (Expert communication)

4.1 Scenario 1 (Public agency communication)

Communication within a public agency/between public agencies
In Scenario 1 (communication between the experts within a public agency and between public agencies or between risk analysts and risk managers) the focus is on internal communication and communication between one public agency and another. The communication players normally come from all areas.

Fig. 3: Scenario 1 (Public agency communication)



Clarify the reference framework
The specific communication challenge within a public agency or between different public agencies involves overcoming organisational, internal communication barriers or communication barriers based on the application of different legal norms. In some cases the same terms are used in different ways; in others various risk assessment methods are applied to the same situation. In others divergence justification forms are used or different statutory provisions apply (for instance with regard to the good or the goal to be protected). For that reason it is essential for these different reference frameworks to themselves become a subject matter of communication even if insiders are completely familiar with these differences in the reference frameworks. As soon as communication extends beyond departments or even public agencies, the reference points which were seen as self-explanatory are by no means self-explanatory any more. They must, therefore, be explicitly mentioned. Furthermore, control and feedback loops are to be envisaged at the interfaces between the public agencies to ensure that the intention behind the information reaches and is understood by the addressees.

Written communication
The starting point and foundation for communication in Scenario 1 is an initial written draft of a scientific risk assessment. This means that written communication takes on an important task particularly in Scenario 1 because it has a decisive impact on the structure and format of the ensuing discussions. One specific trait of written communication is its "retrievability" by the reader, i.e. it is practically available any where any time. It can be copied and, therefore, disseminated. The written word must be stable and valid in a manner that extends beyond the actual act of reading. It can be prepared quietly and adapted through variations in structure, scope and understanding to the addressees. The structure is mostly oriented towards producing a desired condition and facilitates efficient communication. All the same, written communication is one-way communication. Without the possibility of feedback from communication partners, corrections are not possible. This imposes high demands on understanding the messages. Furthermore, the text confronts the readers with a situation shaped by the author's perspective. The situation in which the reader finds himself also influences understanding of a text. The author often doesn't know whether his text has been understood. These difficulties can be reduced when opportunities are created for an exchange and for comments on the written communication. This can be done through suitable software (WORD track changes) in a relatively efficient manner.

Oral communication
Oral communication goes one step further and offers the possibility, because of the option of direct feedback from the communication partners, of reacting flexibly to the needs of discussion partners thereby promoting understanding. Furthermore, the discussions can be seen as a joint event which contributes to attracting attention and improving the degree of information retention. The diverse range of communication tools available means that creative adjustments can be made during the course of discussions. During the discussions interest, motives and forms of behaviour can be identified, misunderstandings and inaccurate assumptions can be dismantled and in this way fairness, effectiveness and efficiency can be improved.

But the discussions also have a downside because, given the dynamics, they are prone to misunderstandings caused by the players' existing views. The rapid development of a discussion makes it difficult for "people who come late" to join in. Intermediate results are normally transient and, given the nature of the event, rarely as impressive as in written communication. In discussions the players frequently react more sensitively to existing hierarchies. Discussions favour participants who have excellent verbal and non-verbal skills. The discussions run the risk of becoming sidetracked when they are not properly structured or moderated.

4.1.1 Model Scenario 1[1]

Model Scenario 1 (Public agency communication):
Communication between the risk analysts within a public agency and between public agencies and between risk analysts and risk managers

Communication between the experts in a public agency or between various public agencies is primarily oriented towards the comprehensible presentation of information, targeted, consistent, transparent and plausible identification of the arguments and results and an efficient exchange of information.

Understandability encompasses unequivocal, transparent, expert and clear terminological use of language and arguments. Specified rules for presentation, analysis and argumentation are to be respected. Above all the technical termini and technical concepts customarily used in the public agency must be applied in a correct manner.

The targeted, consistent, transparent and plausible development of arguments and ideas is based on step-by-step guidance of the readers or listeners from the starting situation over the analysis of the available data and observations down to the conclusions. Each conclusion must be derived from the previous arguments and must be substantiated in a plausible manner. Assumptions and presumptions must be labelled as such.

Efficiency means the avoidance of unnecessary information which is not required to understand the situation, a focus on the main elements and the processing of the material on the basis of a clear and logically plausible structure. The receivers of information must be able to identify in a short space of time the main arguments and also understand the conclusions. In the case of oral communication, too, efforts should be made to ensure targeted, transparent and well-structured discussion moderation. When it comes to communication within a public agency or between public agencies, the external impact is of secondary importance.

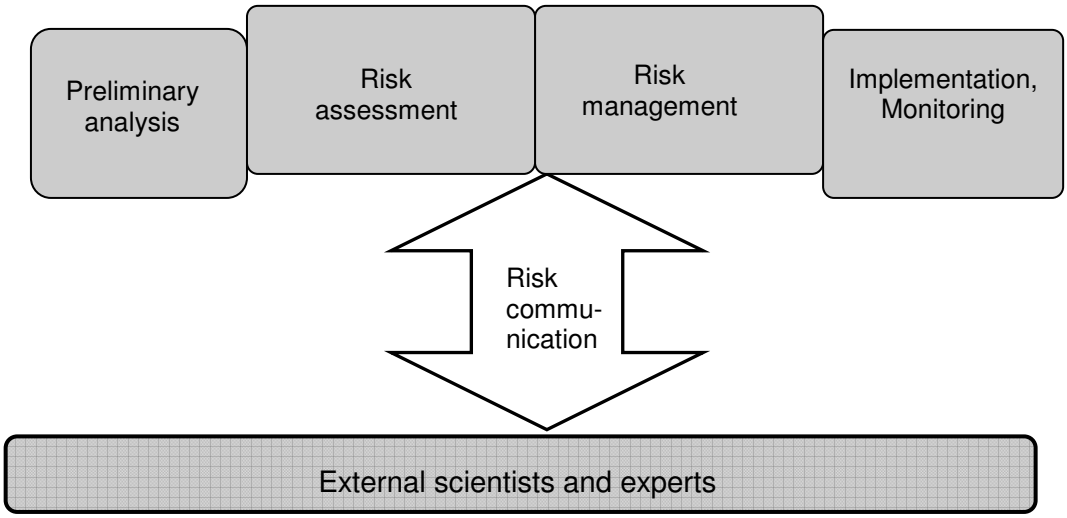
[1] Attention is drawn here once again to the fact that these models are merely orientational. Each public agency must specify its own models in a communication process with staff participation.

4.2 Scenario 2 (Expert communication)

Consideration of divergent views
In communication Scenario 2 (Communication between public agency risk analysts and external scientists or experts) the focus is on an exchange of facts and knowledge or of attitudes and arguments that are relevant for the characterisation of a risk and are linked to the consequences for risk management. Handling and taking into account divergent views or divergent conclusions also plays a major role in this scenario.

Besides representatives of the various departments or public agencies, external risk experts are also involved. The external contributions may challenge or confirm existing scientific knowledge. Here communication is about working towards broadening the knowledge base and substantiating risk assessment.

Fig. 4: Scenario 2 (Expert communication)



Barriers to assessment
In this Scenario the players may arrive at different interpretations and assessments of situations. This may lead to divergent positionings and in this way impede joint risk characterisation and assessment. This danger exists particularly when assessment statements differ substantially between the various departments, public agencies or external experts without there being any plausible explanation for the reasons and arguments. Furthermore, there is a risk that outsiders may consciously choose divergent or unsubstantiated statements and use them in their own interest. This frequently leads to external conflicts, whose causes can be traced back to misleading or consciously misunderstood comments by the participants in communication.

4.2.1 Model Scenario 2

Model Scenario 2 (Expert communication):
"Communication between public agency risk analysts and external scientists or experts"

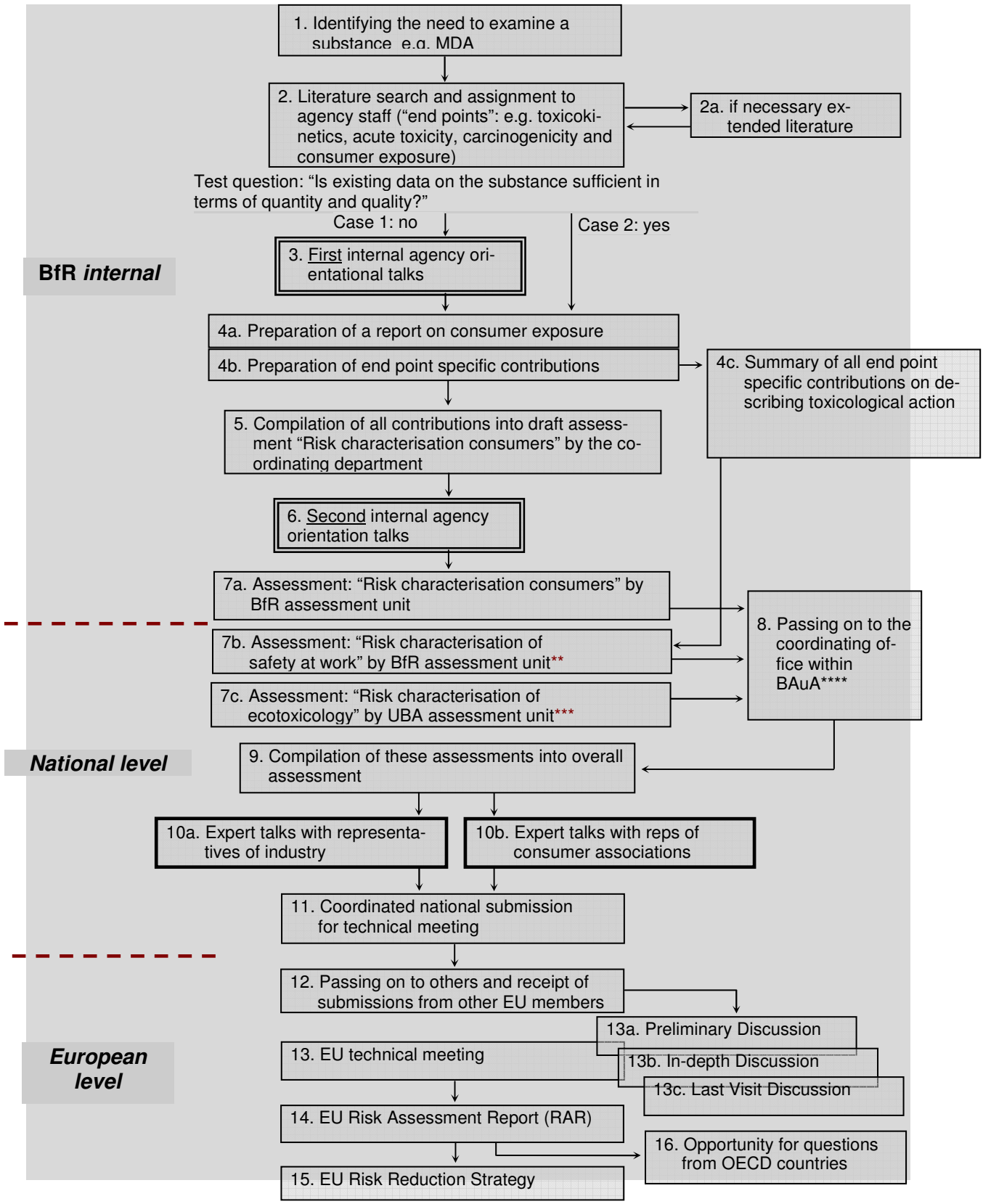
Communication between public agency risk experts and external scientists or experts is primarily oriented towards exchanging knowledge claims and arguments, critically examining the respective evidence, comparing interpretations of situations and giving adequate consideration to divergent views. Communication focuses on the risk characterisation undertaken by the respective public agencies and the related consequences for risk assessment down to indications for ensuing risk management. In this context communication initially provided the

basis for mutual understanding of each other's position and plausibly indicating how emerging attitudes can be taken into account in the characterisation and assessment process.

The presentation of information is co-ordinated within a public agency or between public agencies. The goal of communication in Scenario 2 is the mutual inspection of evidence which is used as the basis for the respective assessments. The involvement of experts from external institutions should also help to procure further data on the topic, to collect and bundle different interpretations of the data and, finally, to arrive at a robust and reliable overall assessment.

Here some thought should also be given to the external impact. Another guiding principle here is that everyone who processes information should do this in such a manner that its unforeseen publication or publication by third parties will not harm the image of the public agency. That's why the model for Scenario 2 also encompasses the contents for the model for Scenario 1.

Fig. 5: Steps for the development of an EU Risk Reduction Strategy using the example of 4,4–methyl dianiline (MDA)



* Examination according to "minimum requirements" according to Annex in EU Existing Substances Regulation
** e.g. decision on carcinogenicity level or workplace exposure
*** e.g. decision on "indirect exposure" (soil, water, air, ...)
**** Federal Institute for Occupational Safety and Health

4.3 Guidelines on Scenarios 1 and 2

4.3.1 Guidelines for the scientific processing of material

- Transparency: The communicating public agency structures the material in a transparent, logical manner.
- Data quality: The communicating public agency provides information on the quality of the data stock (topicality, scientific validity, statistical reliability, relevance for the questions in hand) and how the available data have been incorporated into the assessments, evaluations, interpretations or conclusions. Furthermore some indication should be given of when a renewed examination is due.
- Competence boundaries: The communicating agency draws attention to the existing boundaries to the available scientific findings and experiences, the boundaries to statutory provisions as well as to its own competence in assessments, evaluations, interpretations or conclusions (remaining uncertainties).
- Remaining uncertainties: The communicating agency is urged to indicate the degree of remaining uncertainties and to explain them for the later stages of risk management. More particularly it should outline:
  - suspected random and systematic measurement mistakes, uncertainties in the scope of data extrapolation
  - remaining uncertainties concerning the power of the models used (exposure, dose-response function etc.)
  - the system limits to the observed situations (endpoints used, assumptions about mechanisms, possible interactions with other substances etc.)
  - suspicion about other, as yet unknown, effects (boundaries to existing knowledge about the respective risk).
- Evidence used: The communicating agency reveals which situations, scientific findings, experiences, assumptions or presumptions lead or have led to which assessments, evaluations, interpretations or conclusions.
- Rationale: The communication only includes those conclusions which are either comprehensible (in themselves) without further explanation because of already generally recognised rules for the submission of proof or direct empirical evidence or which can be justified because of the plausible derivation of a chain of thoughts taking into account all assumptions and the conventions agreed by the scientific community (e.g. the level of the safety factors).
- Opposing views: The communicating agency indicates any opposing scientific views and how deviating evaluations, assessments, interpretations or conclusions are justified there.
- Inter-subjective validation: The contents of communication should be "inter-subjective" if possible, i.e. another group of risk analysts would come to the same conclusions when looking at the same available scientific findings and experience and when basing their work on comparable assumptions or presumptions.

4.3.2 Guidelines for the linguistic processing of material

- Media: The communicating agency is urged to use user-oriented media with user-friendly formats. Depending on the context and situation written, electronic or oral reporting forms are to be chosen.
- Glossary: The communicating agency supplements a glossary of terms when new topics or new target groups are used.
- Format: The communication deals with the topics „occasion“, „examination“, „results“ and „reasons” separately and addresses different levels by using suitable numbering (e.g. A.1.1.a.)
- Clarity: The communicating agency uses clear, transparent language and places value on precise, uniform definitions. The communication does not use anything which is detrimental to clarity like for instance masking or „playing down”.
- Structure: The structure of communication is oriented towards the basic format for the respective thoughts and arguments:
  - claim,
  - reasons for the claim (with proof and evidence),
  - possible counter-arguments,
  - synthesis (judgement),
  - connection to the next topic.

  This format can, of course, be adapted if this is deemed necessary.
- No redundancy: Communication avoids redundancy by collecting statements on a respective topic in one place or, in the case of multiple use, by referring to the respective position in the text.

4.3.3 Guidelines for conflict management

- Statement (un)certainty: The communicating agency reveals the degree of certainty and validity behind its justifications and conclusions. It indicates where other interpretations are possible and other assessments are still compatible with the existing database and the existing level of knowledge. In this way it paves the way for a mutual process of understanding.
- Statement boundaries: The communicating agency highlights the boundaries to its own statements regarding endpoints, causally understood or yet not understood mechanisms, possible synergies or antagonisms, exposure assessments, the choice of assumptions made and safety factors as well as other important parameters. Here the goal is to specify the scope for diverging opinions and interpretations and to concentrate communication on those points which are expected to generate real conflicts.
- Exceptions: The communicating agency reveals whether there are exceptional cases in which the evaluations, assessments, interpretations or conclusions do not apply.
- Encourage criticism: The style and content of communication should guarantee that critical people are not excluded or even stigmatised but are actually encouraged to develop constructive proposals for improving risk assessment and feeding this back to the original assessment group.
- Accept objections: The communicating agency takes the objections of potential critics seriously, visualises them where appropriate and illustrates as clearly as possible which of the objections can be taken into account to varying degrees for which reasons. Here the arguments should not be paternalistic or “I know better” in tone even when the objections

are technically flawed. All counter-arguments presented by the communicating agency should be factually based, logical and articulated in a binding manner.

- Identify paths: The communicating agency illustrates procedures for achieving agreement between people with different opinions. These methods are listed at the end of these guidelines.

4.3.4 Guidelines for dealing with external experts

- Categorise conventions: The communicating agency reveals which assumptions, data sets, findings, knowledge stocks, experience and conventions are the basis for its own assessments. In the case of conventions it makes sense to classify them in three categories:
  - theoretically-based conventions (e.g. linear extrapolation in the low dose range),
  - empirical conventions (e.g. the average eating habits of a German) and
  - normative conventions (e.g. choice of the protection good or goal or differences in the choice of security factors between occupational and general exposure).
- Statement (un)certainty: The communicating agency reveals how it deals with uncertainties and ambivalent estimations. It illustrates the degree of reliability and validity behind its conclusions.
- Document sources: The communicating agency documents all sources and refers to the data sets and references used. To the extent that it has input its own experience into the assessment, it is to indicate what this experience is based on. For instance reference can be made to one's own (not systematically evaluated) observations, anecdotal evidence, analogy conclusions or the conventions prevailing in the respective scientific community. It should be clear where scientifically validated evaluations and where the agency's own judgements have been taken over into the assessments. Justifications like "From my 20 years experience I now know that…" do not suffice here.
- Opposing views: The communication encompasses a clear, critical examination of any opposing views and estimates to the extent that they are deemed from the angle of science to be compatible with the explicit and implicit rules of the respective discipline. Pure speculation or misinterpretations which are clear to experts do not need to be addressed in Scenarios 1 or 2.
- Willingness to learn: Communication signals a willingness and ability to learn to the extent that the possible opposing views highlight the need to review the original assessment. Hasty support for an assessment makes it difficult to change one's own position without losing face.

4.3.5 Guidelines for the organisation and staging of technical discussions

- Invitation: The invitation to technical discussions should be sent out in a timely manner to all participants. The agenda, the envisaged duration, the goals of the discussions and any related material should be attached to the invitation.
- Participants: Representatives of all departments which are directly or indirectly involved or familiar with risk assessment should be invited to the technical discussions. It is also advisable to invite the expert for risk communication already at this stage.
- Discussions: When organising technical discussions, more time should be set aside for discussions. Presentations should make up a maximum of 50 % of the time available.
- Agenda: At the beginning of a technical discussion the moderator should briefly explain the goal, the individual items on the agenda, the expected or hoped for results or products

and the duration. If there are presentations he/she also introduces the speakers if they are not known to the participants.

- Establish a focus: When chairing technical discussions, the moderator should ask after each presentation whether any member of the audience has come to completely different conclusions than those of the speaker. This ensures that the discussion does not lose itself in detail but focuses on the essentials.
- Redundancy: The moderator ensures that the participants in the technical discussions do not simply confirm or repeat what other participants have already said or claimed (according to the motto: It has already been said but I'm going to say it again!). Rigorous, efficient moderation is appropriate for technical discussions.
- Consensus and dissent: After completion of each discussion point, the moderator should list the points of consensus and dissent on a flipchart, in a computer display or on an overhead chart. This facilitates the taking of minutes and prevents any misunderstandings.
- Summary: At the end of the technical discussions the moderator sums up the results obtained. To this end he/she uses the noted intermediate results from the discussion of the individual agenda items (see previous point).
- Minutes: The minutes sum up the main discussion elements and the results in writing and are given to participants, the people who were unable to attend but also the experts concerned in the public agency.

4.3.6 Guidelines for presentations and contributions in technical discussions

- Structure: In order to make it easier for participants to understand the material, each presentation should begin with a clear structure which presents scientifically backed functional relations in a graph, sums up the main reasons and arguments either as a handout or as transparencies and systematically lists the main points at the end of the presentation in a synopsis.
- Speaking off the cuff: If possible presentations should not be read out because this usually overstretches people’s ability to listen. By contrast, aids like charts or index cards are recommended because they encourage the speaker to structure his/her presentation.
- Duration: Presentations should never exceed the allocated time. Psychological studies confirm that the listener's attention starts to wander after around 20 minutes. Hence a maximum time of 20 minutes should as a rule suffice for lectures and presentations during technical discussions.
- Comments/questions: The participants in technical discussions should each be restricted to one or a maximum of two points. Lengthy introductions and repetitions are to be avoided. In the case of oral discussions the sequence: claim, reasons, counter arguments and conclusions should be adhered to.
- Addressee orientation: The participants in technical discussions should orient the scale, style and language of their contributions to the prior knowledge and competences of the other partners in dialogue.
- Willingness to learn: All participants in technical discussions should be open and willing to learn.

4.3.7 Guidelines for written assessments

- Reason: The written assessment report describes what (question) prompted the evaluations, assessments, interpretations or conclusions.
- Guide: Each public agency prepares a guide for written assessment reports which outlines the structure, the type of evidence and other instructions. A guide of this kind is already available for the former BgVV.
- The written assessment tries to present abstract issues in graphs or tables and improve readability by highlighting key terms or using pictograms.
- Individual statements: The written assessment report uses sentences in which statements are made on an individual aspect or thought or in which individual statements are smoothly interlinked.
- Responsible contact: The written assessment report indicates who is responsible for the evaluations, assessments, interpretations or conclusions.
- Difference between hazard and risk: The communicating agency stresses the difference between hazard potential (the ability of a substance to potentially cause harm) and the risk assessment (linking the dose-reponse function to the duration and intensity of exposure). Both pieces of information are important for risk assessment. Depending on the context hazard assessment may already suffice to justify risk-reducing measures.
- Recommendation: The written assessment report sums up the most important conclusions and identifies management options which can be pursued within the framework of risk management.

4.4 Methods and aids in Scenarios 1 and 2

In a typical decision-making procedure for risk regulation, what follows after hazard assessment, exposure, dose-response relationship and the resulting risks is an assessment of the respective agent and technical method coupled with management proposals. An assessment of this kind is always based on a mixture of sound knowledge, estimates with an element of uncertainty and normative instructions. A distinction can be made between the following methods and tools although there may be overlaps:

4.4.1 Literature review and expert survey

Reliable risk assessments of simple problems can be undertaken without complicated coordination procedures or formal procedures solely on the basis of the available literature or through questions to the corresponding experts. Transparent, plausible presentations of the arguments play a central role when it comes to justifying the results e.g. in working groups.

4.4.2 Technical discussions

Many regulatory agencies and risk assessment institutions frequently hold technical discussions with external scientists or experts. These discussions aim to secure the additional information necessary to evaluate the situation and to give external knowledge bearers an opportunity to express their views and arguments. This makes it possible for internal experts to gain a comprehensive picture through the exchange of arguments and estimates. The participants get to know the viewpoint of the regulatory agency or other direct players (like e.g. industry or consumer organisations) and source additional information. Technical discussions are not so well suited to resolving conflicts or heated debates. Quite the contrary, under cer-

tain circumstances technical discussions may even worsen the tone of a dispute or lead to polarisation.

4.4.3 Expert hearings

A widespread method of clarifying differences in scientific statements is to invite representatives of the differing views to defend their views to the representatives of the institution (e.g. a regulatory agency). The institution representatives put questions to the experts and then give them an opportunity to expand on their arguments. Sometimes open discussions between the experts are also envisaged during the hearings; however the final decision on how to deal with the dissent lies with the organising institution.

Hearings are excellent and relatively low cost procedures when it comes to getting to know the diverse opinions of experts and the spectrum of arguments which support every point of view. Hearings do not solve any conflicts nor are they designed to achieve consensus. However, they can create clarity about the underlying reasons which lead to the differing standpoints within a conflict.

The authority of the organising institution to take a decision when dealing with dissent depends firstly on its sovereign task and secondly on the social trust it enjoys. Hearings can certainly improve a situation of trust but they do not suffice in order to give legal validity to decisions.

4.4.4 Expert committees

Dialogue: Expert committees, advisory committees and scientific committees are also popular tools for involving external knowledge bearers in the risk management process. They have the advantage over hearings that the experts can communicate freely with one another and are an opportunity for an exchange of knowledge and views. They act independently of the public agency or organisation which set them up.

The disadvantages of expert committees are that they do not normally achieve a consensus, require considerable time in order to come to a decision at an unspecified time, are not always able to address the urgent needs of risk managers and may develop a momentum of their own. Furthermore, expert committees frequently only reach agreement when their members have a similar background and already hold similar points of view. The general public is also extremely sceptical when it comes to the legality of these committees since the criteria for the nomination of the experts are almost always kept secret. Particularly in a high conflict environment, the recommendations of expert committees do not carry very much weight in the eyes of the public at large.

4.4.5 Expert consensus conferences and expert workshops

Purpose: Agreement
In the medical field experts often come together in a workshop to discuss treatment options and to decide on a generally valid standard (treatment recommendation). The workshop is frequently organised both in working group meetings in order to discuss detailed aspects in depth as well as in plenary meetings in order to obtain general agreement and to elaborate general standards which may be valid worldwide. It may make sense, where statutory provisions permit, to use the tool of an expert consensus conference for the purposes of drawing up and formulating joint agreements for risk assessments.

4.4.6 Delphi survey

Purpose: Identifying dissent
When it comes to priority setting, assessing very unsure starting situations or highly controversial evaluation results (e.g. in the field of genetic engineering), the classical methods of group work are often overtaxed. In these cases more complex procedures of cognitive judgement are required. One of these procedures, the Delphi survey, has proved to be particularly effective. This procedure was developed by RAND Co. in the mid-1960s and was initially used for the assessment of defence technologies. Later it was mainly used as a forecast instrument within the framework of technology impact assessments. The Delphi survey consists of the following steps:

Procedure:

1. A research team draws up a catalogue of questions in which the expected consequences of a measure or a decision-making option are examined.
2. The questionnaire is sent to a group of recognised experts in the respective field. The experts answer the questions according to the knowledge available to them and estimate the "subjective certainty", i.e. the estimated validity of their own answers.
3. The research team identifies the average values, the extreme values and the variants in the answers.
4. The original questionnaire is sent back to the experts together with the evaluation of the first survey. The names of the experts are kept anonymous in order to avoid any influence being exerted by status or seniority. The inverviewees are asked to fill out the questionnaire a second time, coupled with the request to use the results of the first survey as a corrective element of their own judgements in their renewed assessment. The purpose of the second survey is to reduce the variance of possible answers and to increase the collective judgement certainty.
5. Steps 2, 3 and 4 are repeated until the experts do not make any further changes to their judgements.
6. Ideally, the Delphi survey singles out the assessments which are liable to achieve a consensus within the expert group or which are the reason for the dissent. By anonymising the participants and through the iterative process of the survey, the respective level of knowledge can be presented without any consideration for the prestige of each participant in the Delphi process.

4.4.7 Group Delphi

One of the main disadvantages of the Delphi survey is the lack of substantiation of judgements which deviate from the median of all participants. That's why, together with a few other authors, we have suggested a modification to the procedure, the group Delphi. In this case the experts are not linked by means of a postal survey and feedback but are invited to a workshop lasting between one and two days. What is important here is that the invited experts represent the spectrum of different attitudes and interpretations discussed by the expert world. At the same time the number of invited experts should not exceed 16 to 20. In the run up to or at the latest at the beginning of the workshop the task and the structure of the questionnaire should be explained to the participants. Then the participants are divided up into between three and four groups in the first round. Each of these small groups of three to four people is given the same task, i.e. to fill out the questionnaire. The goal is consensus but deviating votes are possible. In the plenary those experts, whose assessments deviate significantly from the mean value of all other participants, justify their point of view in front of the others and defend it in a non-public discourse. The goal of this exchange of arguments is to devote the short time available for communication to those topics for which the greatest dis-

crepancy in estimations has been identified. The goal of the discussions is to establish where the dissent lies and whether the discrepancies can be overcome through information and arguments from the other experts.

In a second round the procedure is repeated in new small groups. When putting together the new small groups care is taken to ensure that representatives of the extreme groups from the first round are spread over all the new groups (permutation of members). The sequence of individual group meetings and plenary meetings is continued until no further significant shifts in standpoints occur. At the end of a group Delphi there is normally a far clearer distribution of answer patterns. The estimates of experts are either scattered around a mean value or they make up multi-peak distributions. In the first case a consensus has largely been obtained, in the second case there may be several clear separate positions (consensus about the dissent). In both cases the Delphi supplies extensive substantiation for each position.

At the end of this stage one has a profile of suspected or estimated action consequences supported by experts for each decision option for specific criteria. The criteria may also come from the parties involved and for instance be elaborated using a prior value tree analysis. As a consequence of the expert discussions the verbal substantiations for different assessments are also stored in the profiles as additional information. The disadvantage of the open discussion procedure in the group Delphi is, however, that the participants are no longer anonymous. Prior experience with the group Delphi has, however, shown that status differences have little impact on the group judgement as long as these differences are not dramatic.

The group Delphi process aims to achieve agreement or non-agreement on cognitive statements. The model is the knowledge discourse based on methodological rules with the goal of identifying apparent dissent and overcoming this dissent as well as tracing real dissent back to commonly accepted substantiation logics and, by extension, creating consensus via dissent. A discourse of this kind thrives on its exclusivity. If external individuals or representatives of interest groups are actively involved in this discourse, then the pressure for methodological substantiation of statements is no longer there. In most cases people start strategic positioning in the debate. The discussions frequently end in mutual recriminations particularly when the experts themselves are polarised in their opinions. At best, observers with no right to vote or speak during the deliberations may be allowed to attend. It is also possible to record the discussions with a video camera and this also makes sense for the purposes of documenting the course of the discussion. Exclusivity is not a guarantee for the success of a methodologically driven knowledge discourse but it is at least a necessary precondition. For that reason it is also important to limit the questions to experts to areas of knowledge of relevance for the decision.

Many experts tend to offer the political conclusions as well on the basis of their knowledge. One major task of moderation in a group Delphi is, therefore, to prevent an overstepping of the boundaries of collectively input knowledge and to remain within the area of the substantiated knowledge of the participants. This is also the only way of keeping to the time schedule of between one and two days.

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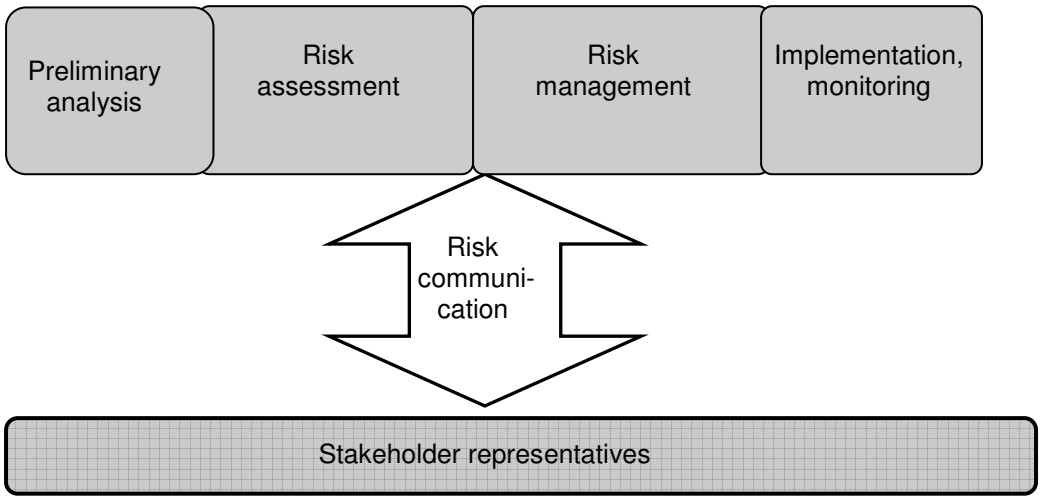
5 Scenario 3 (Stakeholder communication)

Values and weighing up criteria
Public agencies are frequently accused of not taking due account of or even ignoring available knowledge which means that there is no social acceptance for risk regulating measures. Furthermore, the criticism is levied of inadequate plausibility when it comes to specifying protection goals, level of protection or priorities in conjunction with competing protection goals. In Scenario 3 the focus is on different values and weighing up criteria which may vary considerably in a pluralistic society. What is needed is the timely involvement of the representatives of stakeholders already in the preliminary analysis phase, i.e. when establishing the protection goals, the level of protection and the setting of priorities. If the stakeholders have experience or expert knowledge which is of relevance for assessing the risk source, then this can be included in the risk evaluation. This merely means taking into account the knowledge and experience but not the interests of the stakeholders. The interests can be integrated into risk management.

Fig. 6: Scenario 3 (Stakeholder communication)



The risk communication in Scenario 3 between experts from public agencies and stakeholder representatives aims to improve mutual trust. It focuses on the exchange of risk-related information (knowledge, interpretations, conclusions, assessments). Communication forms which facilitate understanding of the standpoints and backgrounds of the other side are helpful. Ideally, risk communication can identify how the concerns and interests of the stakeholders can be taken over into the regulatory process. In this context possible disadvantages for individual groups resulting from the weighing up process should be presented in a transparent manner and plausible explanations given as to why they are unavoidable.

5.1 Model Scenario 3

Model Scenario 3 (Stakeholder communication):
"Communication between public agency risk analysts and stakeholders“

Communication efforts between experts from public agencies and stakeholders are designed to support an exchange on data, assessment and interpretation of the risk in hand. The goal is to improve mutual trust by means of transparent arguments and mutual understanding. The communication aims to bring about:

- mutual understanding of points of view and their interpretation;
- exchange of evidence, interpretations and assessments;
- integration of the concerns, worries and interests of the stakeholder representatives into the public agency assessment process;
- agreement on the further procedure and the type of decision-making process with transparent reasons.

The public agency sees itself as a social service and takes the interests and concerns of those affected seriously. The public agency promises participants that the arguments and objections will be examined and makes the results accessible to the participants in dialogue. In return the representatives of the groups get to know the opinions of the experts from public agencies. The communication explains the statutory provisions and the evidence which have led to the interim risk assessment and identifies where there is room for manoeuvre.

A decision must be taken in advance about which groups with which goals are to be involved at which times, e.g. already during the phase of risk identification or for the interpretation of the intermediate results obtained or for the purposes of sourcing additional data. As a rule as many groups as possible should be given an opportunity to speak in order to permit the entire range of arguments, concerns, worries and interests to be presented. The communication should ensure that the ideas, statements and criticisms are formulated in such a way that they can be understood in the way in which the speaker intends.

5.2 Model for Scenario 3

5.2.1 Guidelines for processing the material for presentations

- When processing this material the communicating agency should keep the concrete socio-political context of the partners in dialogue in mind as the risk information in the presentation should be directly linked to the life circumstances of the participants.
- The communicating agency should orient itself towards the interests of the addressees and take the needs and concerns of the addressees into account when processing the material.
- The communication should process expert knowledge in such a way that the statements from those involved can be understood without any in-depth technical or natural scientific knowledge. Technical terms should be avoided if possible or only those terms should be used which are essential to understand the statement.
- Central statements should be rendered clearer through illustrations from the area of the addressees. Complex situations should be presented graphically if possible.
- The public agency should communicate all risk-relevant findings known to it.

5.2.2 Guidelines for the presentation of assessments

- The assessments should be related to the experiences of the receivers. Consideration should be given to the differences between the individuals concerned or groups within pluralistic societies or between various cultural sub-groups (for instance foreign citizens).
- The communication passes on the available scientific findings, experiences, assumptions or presumptions as well as the judgements made, assessments, interpretations or conclusions in such a way that they help addressees to make up their own minds.
- The communication reveals where there is clear scientific evidence and where precautionary action is or should be taken on the basis of evidence or incomplete knowledge.
- Communication creates transparency about all implicitly integrated value judgements. More particularly it should outline the following:
    - the desired protection target (if specified);
    - the reasons for the choice of security factors or other normative conventions;
    - characterisation of the remaining uncertainties and the residual risk after regulation (if possible quantified, otherwise within the framework of plausible ranges);
- If this is scientifically possible, probabilities should be quantified (for instance: four expected cases of disease when 10,000 people are exposed to a specific substance concentration).
- In this context risk comparisons should only be undertaken for those risks which are generally perceived to be comparable (see Chapter 7: "Risk comparisons").
- The communication encompasses quantitative risk statements as well as information on qualitative characteristics which are linked to the risk in **intuitive risk perception**. They include:
    - personal or institutional control opportunities
    - maximum scale of disaster
    - sense-related perceptibility of the risk
    - perceived opportunities for self-protection
    - perceived distribution justice
    - perceived benefits
- The communication reveals the difference between hazard and risk by providing additional information on dose, exposure and contamination circumstances.

5.2.3 Guidelines for the organisation of discussions with external stakeholders

- All potentially affected groups must be included in the assessment discussions. Care should be taken to ensure that not only the people causing the risk but also the "risk bearers" are appropriately represented.
- The organisers involve those concerned early on so that the results of the communication can be taken over into risk assessment.
- The organisers endeavour to establish fundamental agreement with the stakeholders in preliminary bilateral talks on the discussion framework for the debate.
- The organisers invite the participants in a timely manner to the technical discussions. The agenda, goal catalogue (what is to be achieved), a list of participants, written documents on risk characterisation or assessment are to be enclosed with the invitation.

- In the case of highly controversial topics it is advisable to engage an external professional moderator to chair the assessment discussions. In the case of less controversial topics an in-house trained moderator can assume this task.
- In the course of the assessment discussions as much time as possible should be allowed for discussion. Prepared statements should take up a maximum 50 % of the available time.
- The timeframe for assessment discussions should allow enough time for processing but impose limits on the time for talks and review.

5.2.4 Guidelines for the moderation of discussions with external stakeholders

- At the beginning of assessment discussions, the moderator – in close co-ordination with the participants – establishes the joint goal and the purpose of the discussions (create understanding, exchange assessments, integrate concerns, decide on further procedure).
- After establishing the joint goals, the moderator should briefly explain the individual agenda items, the expected or hoped for results or products and the timeframe. After that, he/she asks all participants to briefly introduce themselves and to indicate their personal or institutional links to the subject of the assessment discussions.
- As a rule the public agency extending the invitation should give a short factual report. This report should address the facts and the planned assessments. This should be followed by a round of prepared and invited statements from the circle of participants. Each statement should be short and to the point (around 15 minutes).
- After the presentation of the statements it is the moderator's task to identify together with the participants the points of consensus which have emerged and then to steer discussion towards the points of dissent. During these discussions techniques like the meta plan or value tree analysis may be used.
- During the discussions the moderator endeavours to actively reveal the interests and intentions of all those concerned. In this way fake conflicts can be avoided and discussions can be steered towards the main differences.
- The moderator shows the same degree of respect to all participants and creates a platform for everyone to put forward their claims. This is linked to the obligation of explaining claims in depth.
- The moderator ensures that the participants in the assessment discussions do not reconfirm or repeat what other participants have already said or claimed (according to the motto: everything has been said but I haven't said it yet!). Streamlined, efficient moderation is in the interests of all participants.
- The moderator should work through the agenda items but also respond flexibly to new situational requirements. In house moderators should undergo prior training in this. It is important to practice how to respond spontaneously to requests for changes by participants without jeopardising the overall desired result.
- The moderator should reiterate the points of consensus and dissent after the completion of each discussion point and, if necessary, present them visually (e.g. using flipcharts, meta plan boards, computer displays, overhead transparencies). He/she should, if possible, filter out and document all ideas on the risk topic. The obligation to record everything before the eyes of the participants facilitates the minute-taking task and avoids any misunderstandings.
- At the end of the assessment discussions the moderator once again gives a summary of the results obtained. To this end he/she uses their notes on the intermediate results from the discussion of the individual agenda items.

- At the end of the meeting the moderator gives contacts for further information. The moderator explains how the results of the talks will be further processed within the agency and describes how participants can be included in this.
- The minutes contain a written summary of main items discussed and are made available to participants and other interested parties.
- After the end of the assessment discussions a press release is a good idea if the topic is of interest to the general public. The text of the press release should be agreed with the participants during the assessment discussions.
- Experience with the procedure and the course of the assessment discussions should be systematically collected and evaluated. This increases the experience of a public agency with communication tools of this kind and facilitates ongoing learning by doing.

5.2.5 Guidelines for dealing with conflicts

- The moderator explains that conflicts are normal and endeavours to use them for constructive processing. He/she is prepared for conflicts and has mediation tools at his/her disposal.
- The moderator allows time for the expression of discontent and other emotions but is not "infected" by them. The same applies to internal participants. They should strive to be factual and committed without adapting their tone or choice of words to the emotional comments of the other participants.
- If highly emotional or even aggressive statements are to be expected from participants, then the moderator should begin by outlining the rules for the assessment discussions and, if possible, get all participants to approve them. One of the rules should be that there should be no emotional attacks on persons or institutions or personal condemnations or accusations. If this is proposed at the beginning of the discussions, the participants normally agree. The moderator can intervene in a timely manner when someone fails to respect these rules during the discussions.
- If, however, some of the participants still make aggressive comments, then the public agency representatives addressed should indeed show their emotional concern without replying "in the same vein". What frequently helps in situations of this kind is the endeavour to achieve a common basis for understanding on a more abstract level (for instance: We both agree on one thing, we both want to protect consumers as best we can…).
- The moderator shows understanding for personal concerns but repeatedly points out that risk assessment must have collective validity and is, therefore, dependent on taking on board many different points of view and concerns.
- In the course of the discussions it is the task of the moderator to find a "common denominator" which is valid for everyone. If a consensus cannot be achieved, it is the task of the moderator to establish a consensus on the dissent, i.e. to identify and document the respective reasons for the various assessments or interpretations.
- The acting public agency learns from conflicts and revises its procedures (model of a learning organisation).

5.3 Methods and aids for Scenario 3

5.3.1 Hearing for stakeholders

In many democratic countries, for instance the US, Australia, UK, France, Switzerland, Germany and Austria, hearings are statutory components of many approval procedures, regional impact analyses and eco-audits.. For instance in the USA the Administrative Procedures Act from 1946 stipulates that public hearings must be staged for all projects with major public sector involvement that may have a major impact on the population. Hearings are the most widespread form of structured participation in democratic countries. They are also taking on increasing importance in the Directives of the European Union.

The main advantage of the hearing is the possibility for public agency representatives to get to know the worries and concerns of the people affected or the interests of the various groups. In principle all those concerned are admitted to a public hearing, i.e. the principle of fair representation is upheld. However, practice has shown that it is normally only the activists and representatives of organised interest groups who come to the hearings. In most hearings there are rules for the giving of evidence which only permit factual statements. Finally, hearings are tools for the exchange of information: the stakeholders get to know the views of experts and representatives of public agencies, the public agency representatives are confronted with the problems and views of the stakeholder representatives.

The rigid rules of the hearing do, however, have some disadvantages. Hearings are normally staged so late on in the risk assessment process that they can no longer fulfil their purpose of facilitating a correction if there are serious objections.

Other disadvantages:

- Because of the limited time and the prerogatives of the panel participants, only a few people have an opportunity to speak. Often lists of speakers are drawn up beforehand or the contributions have to be submitted in advance in writing which means that spontaneous comments are no longer possible.
- The equality principle is infringed through the division between panel and audience. The participants on the panel normally have special rights (other time limitations).
- The representatives of the public agencies rarely stage hearings because they want to hear and take on board the concerns of the stakeholders; in general they merely formally comply with the statutory provisions.

Furthermore, there are a few other problems which have emerged above all from hearings in the environment and health sectors in Germany.

- In many cases objections and legal action are only possible for highly specific groups; other equally affected groups are excluded.
- Under current German law it is not possible for associations to take legal action. Organised groups must normally fall back on the citizens concerned in order to have their concerns represented at the hearings.
- When deciding on the structure of a hearing, recourse is often made to complex, internal preliminary agreements from which the complainants are generally excluded and which they don't find out about until the hearing.

Most empirical studies, therefore, come to the conclusion that hearings have only led in very few cases to changes in assessments (which doesn't mean that these changes were always necessary). Godschalk and Stiftle (1981) examined for instance the hearings in North Carolina on water management planning. They came to the conclusion that objections from the groups only influenced decisions in exceptional cases. Irrespective of how open public

agency representatives are to objections, the format of the hearing normally leads to a worsening of the conflict rather than to defusing it. The people making the objections know that their only chance to influence the results is by exerting as much public pressure as possible and by flooding public agencies with so many objections that the project can no longer be pushed through politically. The public agency representatives who conduct hearings feel that this reduces them to the role of the fall guys. They scarcely pay any attention to the contents of the objection but do everything they can in order to conclude the procedure in a formally correct manner. This has nothing to do with dialogue. The entire procedure has then become an empty ritual which merely makes the two fronts more entrenched and encourages strategic positioning.

5.3.2 Negotiations between important stakeholders

This form of conflict resolution is predominant in Europe, particularly in the United Kingdom, Germany and Switzerland but is also used in the USA under the name "Negotiated Rule Making". The goal of this strategy is to involve the important, supraregional stakeholders in the decision-making process so as to take into account the values and interests of these groups when noting preferences in the decisions. In order to avoid strategic manoeuvring by the participants vis a vis the outside world, these negotiations normally take place behind closed doors. Corporatist negotiating strategies of this kind are relatively effective when there is an emergency and the stakeholders in principle agree that action has to be taken. Where there is no such pressure, then it is normally in the interests of at least one of the participants to keep the process up and running for as long as possible and to delay results until growing public pressure forces a decision. Corporatist solutions, therefore, have three decisive disadvantages:

- Firstly, they exclude all those groups who do not want to or cannot comply with the rules of non-public negotiations because they would otherwise lose their clients (example: citizens' action groups);
- Secondly, they only reflect to a minor degree the interests and values of the people directly affected by the decisions and
- Thirdly, they lead to a legitimisation deficit in the decision taken because the general public was unable to take part in the decision-making process (lack of transparency). The perception of non-transparency and presumed “wheeling and dealing” exposes decisions of this kind to public criticism and a lack of acceptance.

5.3.3 The round table as a discursive procedure

Goal: To achieve agreement on risk assessment, round tables can be used in which the representatives of public agencies and the groups affected by the assessment have equal rights.

Procedure: A round table begins by specifying the structure of the dialogue and the rights and obligations of all participants. It is the task of the moderator to present and explain the implicit rules of the round table to the participants. Furthermore, the participants must jointly lay down decision-making rules, the agenda, the role of the moderator (also in respect of mediation), the sequence of hearings etc. This should always be done according to the consensus principle. All parties must be able to agree to the procedure. There should be unanimous agreement on definitions, possible classifications or other linguistic and comprehension tools. If no agreement can be reached, then the round table must be cut short and postponed to a later date.

Decision making tools often used in negotiations or round tables include value tree analysis and multi-attrubute decision analysis. Those will be described here in brief terms:

Value tree analysis
Once the procedure has been defined, it makes sense to specify the range of statutory foundations (normative statements) which are relevant for the assessment. What is meant here is agreement on the principles which are relevant for the problem in hand. Various methods like the value tree analysis are, in principle, suitable. On the one hand it is necessary to only admit those statements which are closely linked to the topic; on the other hand for the purposes of fairness it is necessary to take into account all values and standards which are presented by the respective parties as far as possible. In this conflict experience with round tables shows that efforts should be made to record all the values within the framework of conflict mediation even if the list of values then becomes very long. By contrast, if one reduces discussion to obviously clear values or if one restricts the choices of participants too early on, then some parties will always feel disadvantaged and relaunch a new "fundamental debate" at some other stage. In the course of the later negotiations less discriminating values can be excluded.

Multi-attribute decision analysis
Once the values, standards and goals necessary for assessment have been jointly agreed, arguments are exchanged. Four steps can be undertaken to examine the arguments on the basis of analytical decision-making logic:

1. Establishment of criteria

A first step involves converting the values and standards accepted by the discourse participants into criteria which directly influence risk assessment (for instance the laying down of the protection good, the determination of the protection goal, the relevant provisions etc.). This conversion must be approved by all participants.

2. Validation of knowledge claims

Informed individuals or institutions are asked to assess the evaluation options available according to their best level of knowledge (cognitive correctness). Here it makes more sense to specify a common methodological procedure or a consensus on the experts to be interviewed rather than allowing each group to have its questions answered by their own experts. Frequently, many potential consequences are still contested at the end of this process, particularly when there is a degree of uncertainty. However, the range of possible opinions will be more or less reduced depending on the level of knowledge. Consensus about dissent also helps here to separate controversial from non-controversial claims which promotes further discussion.

3. Interpretation

The ranges of expected effects must then be interpreted by the parties. Interpretation means linking factual and value statements to an overall assessment. This assessment can and should be undertaken separately for each aspect of the assessment (for instance acute health damage, environment impact etc.). In this way the respective causal chains leading to judgements can be more readily understood. For instance, when interpreting a limit value the question of trust in the regulatory agency can play an important role. It is then down to the participants to take a closer look at the track record of the respective public agency and, where appropriate, to suggest institutional changes.

4. Weighting and weighing up

Even if there were an assessment and interpretation based on common consent, this still would by no means mean that there will be agreement. It is far more the case that different judgements on decision-making options of the participants can be traced back to different value weightings. For instance, a committed environmentalist will attribute far greater impor-

tance to protecting a biotope than a representative of industry. In the literature on game theories and economics, this conflict is deemed to be unsolvable unless one of the participants can convince the others to abandon their preference through the payment of compensation (for instance as subsidies), transfer payments (for instance a special service) or trade offs. In reality, however, participants in discussions are indeed open to the arguments of other participants (i.e. willing to give up their initial preference) when this loss is still acceptable for them and, at the same time, the proposed solution is deemed to be "conducive for the common good", i.e. is deemed to be socially desirable in the public perception. If no consensus is reached, then there can and must be a compromise solution which involves negotiating a "fair" distribution of burdens and benefits.

During a round table the conflicts described here with regard to the procedures, facts, interpretations, value weightings must first be identified and then dealt with in a targeted manner through interactive procedures.

5.3.4 Mediation

Characteristics
Mediation procedures involve the bringing in of a neutral mediator for the purposes of conflict resolution and the bringing together of the parties to the conflict who then look for solutions in an atmosphere which is conducive to reaching a consensus or at least a compromise. In the USA mediation is closely linked to the model of negotiation and compensation for acceptable disadvantages taken from rational actor theory. The theoretical foundation for mediation is the game theory and its particular application in the negotiation theory as anchored in the so-called Harvard Model. There it is assumed that the entrenched positions of the negotiating partners can be broken down through disclosure of their real interests and can be turned into a win situation for all those concerned (win-win situation). One good example is the case of two chefs who are fighting about a lemon. Instead of cutting it in half, it transpires in the course of the dispute that one of the chef's needs the lemon peel to bake a cake whereas the other needs the juice for his tea. Both sides profit by separating the lemon into juice and peel rather than splitting it through the middle.

Mediation procedures are increasingly gaining a foothold in Europe. The use of mediation is not just about resolving conflicts. Like precautionary environmental and health protection, risk assessments can also be prepared in a participative manner before they escalate into conflicts. The timely bringing together of different attitudes, interests and functions of people at a round table can help.

It is largely down to the moderator to help participants to examine the validity of their statements on the basis of previously specified rules. A good moderator has the following characteristics:

- absolute neutrality in the matter at hand,
- sufficient technical expertise,
- knowledge about statutory rules and provisions,
- expertise and practical experience in chairing discussions,
- social skills in dealing with groups and individuals,
- communication skills,
- focus on the common good,
- social respect.

Framework conditions
Mediation procedures are bound by specific framework conditions. They are suitable for between 25 and 30 people who, in turn, should not represent more than five to ten parties. The participating parties must be able to fall back on a common store of values and goals if there

is to be any chance of agreement. Furthermore, it is helpful in the unification process if the parties are already organised and have addressed this topic prior to the procedure.

Problems
Although mediation procedures are largely organised on an egalitarian basis and lead to competent judgements, a number of problems remain. The negotiations normally take place behind closed doors which makes it difficult to verify the statements. This has a negative impact on the legitimisation of the results vis a vis non-participants. Many analysts are, therefore, of the opinion that mediation is only suitable for those cases in which the knowledge basis has been clearly defined, the general goals are not disputed and the emotions of the participants only play a minor role. In such cases the different points of view stem from differing interests. For that reason the literature on mediation procedures specifically stresses the use of analytical decision-making or game theory mechanisms for the balancing of interests.

Challenges
The choice of the rules for discourse management by participants is a major characteristic of the procedure. Even if all parties cannot participate, this does facilitate at least a representation of the main opponents. The common good can be defended by balancing the possible extremes in the opinions represented. Nevertheless, the lack of participation by unorganised or weakly organised groups continues to be one of the shortcomings of the mediation procedure. That's why they cannot replace the discourse with individuals who are affected but not organised in groups. Furthermore, mediation procedures run the risk of achieving agreement amongst the participating representatives of the invited groups but of them then being unable to convincingly communicate the solutions to their own members. Their members do not, therefore, feel that they are bound by the negotiated results and may even seek to strip their representatives of power. Without ongoing communication of intermediate results to the members of the groups participating in the mediation procedure, the results of mediation are normally of no further value.

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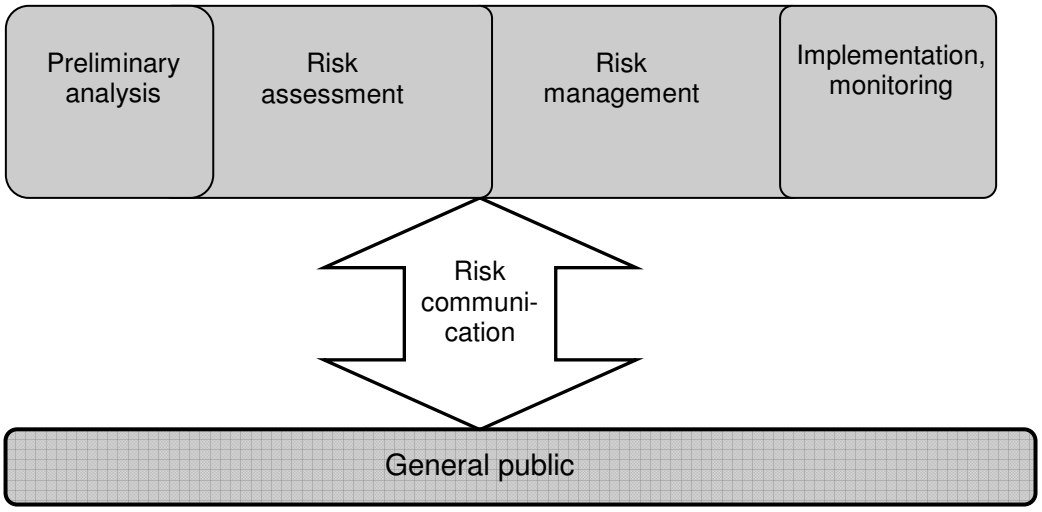
6 Scenario 4 (Communication with the general public)

Communication with the general public brings special problems with it because the general public is a construct for a range of non-organised groups without directly addressable representatives. Risk communication procedures in this Scenario are, therefore, more diffuse and risky than those in Scenarios 1 to 3. Nevertheless, despite these constraints, there are important reasons for actively involving the general public in risk communication. In certain situations, particularly when the local interests of citizens are affected by risk-regulating measures, the direct participation of people in the decision-making and implementation process is advantageous.

Fig. 7: Scenario 4 (Communication with the general public)



Acceptability
In the case of risks which are the subject of controversy in society, risk communication with the general public should begin early on, in the preliminary analysis phase. This involves fundamental questions about the acceptability of risk sources of this kind as every member of society is affected by them. Furthermore, risk communication should also look at those risks for which no scientifically identifiable threshold value is available within the framework of the models used. In this case any exposure that is greater than zero means a risk, even if this risk is sometimes minute. In this case limit values must be established up to which the residual risks can still be classified as acceptable. Some countries like the Netherlands and Switzerland have formally established numerical acceptability limits in certain application areas: for instance one fatality per million cases of exposure per year. A decision about which limit value can still be deemed acceptable in this context must be widely discussed in society. Social discourses of this kind are advisable when the consequences of risk-regulating measures lead to economic burdens that extend far beyond the norm (e.g. cost-intensive protective measures against terrorist attacks).

New tools
In this Scenario more recent tools like citizens' consensus conferences, citizens' fora and advisory committees can be used alongside the somewhat more classical tools like hearings and panel discussions. Wide impact tools can be used to reach the people who up to now had been somewhat critical of classical information tools.

6.1 Model Scenario 4

Model Scenario 4 (Communication with the general public):
„Communication between public agency risk analysts and the general public"

All risk communication efforts should be oriented towards the model of risk judgement sovereignty. The communication should give all interested citizens an opportunity, on the basis of an understanding of the proven impact, the remaining uncertainties and the justifiable interpretation scope, to undertake a personal assessment of the respective risks in line with their own criteria or with ethical criteria deemed appropriate by them for society. In this context communication is an open process of the mutual comparison of information and arguments.

6.2 Guidelines for Scenario 4

6.2.1 Guidelines for processing material for the general public

- Communication contains simple, clear messages and is appropriate despite the complex nature of the subject. Frequently it helps to present the simple important messages at the beginning of the text and to deal with the more complex elements at the end of the message. Very interested readers or listeners are very willing to digest the entire text of the message; people who only have a superficial interest in the subject will already feel that they have obtained sufficient information from the introductory sentences.
- Communication adapts flexibly to different situations with suitable methods. Depending on the communication context, other media or transmission channels are to be selected. The public agency publishes risk-related results in those media which are also used by the addressees.
- The material for communication is complete and contains all relevant information. It provides information on data and references for more in-depth information.
- The material is well illustrated and gives an intuitive access to the scientific foundations, the statutory provisions, the scope for action and the conclusions drawn by the public agency.

6.2.2 Guidelines for the presentation of material

- Communication characterises the current level of knowledge about an exposure situation (quantitatively and qualitatively). Besides the level of the measured or presumed risk, behavioural measures are also addressed for the purposes of risk reduction or avoidance.
- The text of the communication is also geared to particularly sensitive groups to the extent that this makes sense within the framework of the risk involved. What is particularly important is information on suspected effects in infants, children, senior citizens and the chronically sick.
- The communication text explains the quality of the knowledge basis and stresses that more exact and improved results are to be expected in future through further research. The communicating agency indicates a timeline and responsibilities for the expected research results.
- The communication admits any remaining uncertainties and shows that the public agency can adopt a precautionary stance even if all the effects are known when there is sufficient suspicion of potential damage (explanation of the precautionary principle).
- The communication text avoids bureaucratic and legal jargon but does pay attention to the possible legal implications of a statement.

- The communicating agency makes it clear that it is available at any time to answer further questions or accept comments and gives the names of the corresponding contacts.

6.2.3 Guidelines for dealing with other opinions and assessments

- The communicating agency states its reasons for an acceptable risk level and stresses its willingness to accept proposals from other social players about a tolerable or intolerable risk level (including the establishment of a limit value).
- The communicating agency provides clear, logical justification for the risk assessment and the recommended risk management measures.
- The communicating agency is always available for discussions with media representatives.

6.2.4 Guidelines for the moderation of public discourses

- At the start of a public discourse, the moderator begins by explaining the goals of the public event, the rules and the planned procedure to the audience. In this context he/she should appeal to the fairness of the participants and expressly point out any time constraints (for instance allocated speaking time).
- After determining the goals and the timeline, he/she asks all participants in the panel or possible speakers to briefly introduce themselves and to explain their personal or institutional affiliation to the subject of the public discourse.
- As a rule the invited speakers should not address the forum for more than 15-20 minutes. If more than six speakers are to address the meeting, each statement should be for a maximum of 10 minutes.
- After the presentation of the statements the moderator presents the consensus points to the audience which have emerged and clearly repeats the points of dissent. Here he/she can draw on presentation techniques like for instance the meta plan method.
- During the panel discussion the moderator actively tries to reveal the interests and intentions of all those concerned. In this way fake conflicts can be avoided and the discussion can be steered towards the main differences.
- The moderator shows the same respect to all participants in the panel. He creates a forum for everyone to put forward their claims. This comes with the obligation to keep to the allocated time.
- The moderator ensures that each panel speaker complies with his/her allocated time. This should be intimated to the speakers beforehand as well.
- If the communicating agency is represented on the panel, then the speaker should respect the following principles:
    - The presentation should be friendly and caring in tone but clear and decisive in terms of the matter in hand.
    - The reasons which have led to a certain assessment should be explained. The right to reach different conclusions based on these arguments should also be recognised.
    - The links between the assessment and statutory instructions (protection goal) should be clearly identified.
    - The spokespersons of a public agency should behave as individuals but, at the same time, indicate their presence as representatives of a certain institution. Under no circumstances should a gap be intimated between one's own personal and the institutional assessment (even if one was unable to assert one's position in that institution).

- The spokespersons of a public agency may avoid customary role expectations by presenting their personal procedure and adapting communication to the personal experiences of the audience.
- In public discussions most of the listeners are not only interested in the level of the risk but also in steps to limit or reduce the risk. One-third of the time should, therefore, be set aside for the discussion of possible protection measures.
- If the spokespersons of the public agency are personally attacked and the moderator does not intervene, then personal dismay and related hurt should be addressed calmly (for instance: Do you think that I want your children to suffer damage to their health? Who do you think I am?). Under no circumstances should one return fire with the same weapons.
- In the discussions one should rely on one's own skills and intuition. The impact of rhetorical skills is often exaggerated. Pensiveness, personality, level headedness, a commitment to the respective protection goal, personal dismay – these are all elements of public speaking which are well received by the audience. In particular the spokesperson should not put on an act. Most people have a good feeling for authenticity.
- The moderator should strictly work through the agenda items after the statements by the panel participants but also respond flexibly to the audience. If the audience becomes restless, then the floor should be opened to them for questions but a time limit should be imposed so as to be able to keep to the agenda.
- On completion of each discussion point the moderator should briefly sum up once again the points of consensus and dissent. He may use technical aids for this.
- If there is provision for the participants to take questions and comments from the audience (always recommended), then a time limit should be imposed from the outset. Otherwise the risk of co-speeches is very high.
- When there is a large number of participants, it is advisable that questions/comment cards should be distributed to the participants at the beginning on which they can put their name (another option is the additional listing of questions on each card; then the questions can be assigned during the break to specific topics). During the discussion the cards are randomly selected and the people are asked to put their question or make their statement. In this way it is not just people who talk a lot and functionaries who have an opportunity to speak.
- The moderator should ensure that the experts or panel participants give short, concise answers to the questions and comments. The audience can become very frustrated if they are not able to put their questions or comments because time runs out. As a rule questions should be collected (roughly 3-5 per round) in order to leave enough time for the audience to speak.
- At the end of the public discourse the moderator once again sums up any results. He thanks the panel participants and the audience.
- At the end of the meeting the moderator gives contacts and addresses for more in-depth information. He/she explains how the results of the discourse will be further processed by the agency and indicates how the audience or certain stakeholders can be involved in this.
- After conclusion of the assessment discussions a press release is a good idea to the extent that the topic attracts public attention. The text of the press release should be agreed in advance with the panel participants.

- Experiences with the procedure and the course of the public discourse should be systematically collected and evaluated. This increases the experiences of a public agency with communication tools of this kind and facilitates learning by doing.

6.3 Methods and aids for Scenario 4

6.3.1 Advisory committees with the stakeholders

The main task of advisory committees is to pass on information, arguments and recommendations to decision-makers. Sometimes they also act as intermediaries between public agencies and the general public. The members of the committees are generally appointed by a state institution. They are normally called on because they are deemed to have the necessary expert knowledge or because of their position in a social group or political organisation. In isolated cases members of the general public are also appointed to these bodies.

Almost all political institutions which deal with environmental, consumer and health protection draw on the services of advisory committees. In the environmental, health and consumer protection areas, committees are also formed from representatives of industry, consumer associations or other interest groups in addition to pure expert bodies. These lay committees are particularly popular in the USA and Switzerland.

The special advantage of these advisory bodies is that the members enjoy considerably autonomy when it comes to choosing the style of negotiations and the decision-making rules. Aside from their remit they are free to put together their agenda, to choose a moderator for their meetings and to define the workload. The main problem of committees is their composition. Committees are normally set up on the invitation of the responsible public agency. For obvious reasons the agency is interested in only appointing those advisors who agree in principle with their policies. Furthermore, there is an adaptation effect in institutionalised advisory committees. Someone who has been with a specific institution for a long time, increasingly identifies with it and the goals and tasks of that institution. There is nothing wrong with this principle but more recent findings and interpretations (see BSE) are often ignored. Finally each committee is dependent on the good will of the institution which appointed it. Although attempts at manipulation are rare in practice, and would have a counter productive effect in most political areas, the nominating institution can exercise major influence indirectly on the work of the respective committee by means of budget decisions, function definitions and nomination cycles. In most cases the moderators of these advisory committees come from or are selected by these public agencies. For that reason committees have been set up in some countries which can assume their tasks independently of specific institutions.

This means that advisory committees are, in principle, able to introduce new proposals into the discussions and to elaborate solutions to problems on their own initiative. However, there are no incentives for this and the regulatory agency may not be in favour of independent activities of this kind. The criterion of fair representation of all the stakeholders is as a rule violated unless all participants have equal access to the advisory committees. Nevertheless, advisory committees may be an important component in a risk assessment process; however additional elements are required in order to tap more into the potential of dialogue-oriented communication.

6.3.2 Citizens' fora (planning cells and citizens' juries)

The involvement of representatives of the public at large in decision-making processes is the main goal of this type of procedure. As in the case of advisory committees, there is a wealth of different forms which cannot all be looked at individually. Reference is made at this point to all those procedures which differ from advisory committees in that they give each concerned citizen the same opportunities to participate in the decision-making process. Equal opportunities on the local level can be achieved by inviting all those who are potentially affected and facilitating their participation in terms of logistics and time. In the case of more extensive projects recourse must be made, by contrast, to a selection procedure based on the voluntarism principle or according to a representation method (for instance delegation or random choice). Procedures of this kind aim to ensure that each person concerned has equal chances of participating irrespective of his/her social position or the degree of organisation of his/her interests.

Two models of citizens' fora have been theoretically elaborated and implemented in practice. Peter Dienel from Wuppertal University has coined the term planning cell for these fora. Planning cells are committees of between 10 and 25 people who are selected randomly and who devote some of their time for a few days, for which they are remunerated, to offering decision-making aids on specific questions. The underlying philosophy of the planning cell is the desire for fair representation of all those concerned in the preparation and taking of decisions. The planning cell has been used to deal with a number of problems on both local and regional levels.

The second model comes from the Jefferson Centre for Democratic Processes in Minneapolis (U.S. Federal State Minnesota). The founder of the Centre, Ned Crosby, has given is citizens fora the name of "Citizens' Juries". This designation aims to highlight the proximity to juries in the USA. In the same way that jury members use their common sense to determine whether an accused person is guilty or not, the citizens' juries make a recommendation on political options after hearing all the witnesses (experts and representatives of various interests). The model of citizen juries has been used in environmental regulations, educational problems and when electing municipal and regional parliaments in Minnesota.

The legitimacy and efficacy of planning cells or citizens' juries is tied to three preconditions: firstly the decision-makers must undertake either to accept the recommendations or at least to take them into account. Secondly, the organised interests involved in the conflict must agree or at least tolerate a mediation solution. This is more likely to happen when the parties no longer perceive any opportunities to resolve the conflict themselves but are more and more convinced that they will be able to present their point of view in a convincing manner to the mediation court. All parties are, therefore, invited to speak as witnesses and present their recommendations. Thirdly, a sufficient number of citizens must be prepared to take on board the obligations linked to participation in the planning cells.

Legitimisation problems are to be expected above all when the population concerned is affected to very varying degrees by a measure. In this case the people who are most affected expect to be given more representation in the citizens' fora than they would be allocated by the random principle. Finally, it has been shown that fora, which do not produce any solutions to problems but only indicate approval or rejection of a measure, systematically vote for a refusal because this leads to the fewest internal conflicts within the fora. By contrast, problems which encompass different options with both disadvantages and advantages are particularly suited for citizens' fora. One special advantage of citizens' fora is the possibility of staging several fora at the same time to address the same issues. This is one way of testing the robustness of the proposed solutions.

The main problems of the citizens' fora are in the area of expertise and follow-up knowledge. Although the fora offer an opportunity to exchange arguments and to use the group dynamics for the assessment of competence, explicit evidence of competence and knowledge are missing. The willingness to listen to experts is no guarantee that factual statements will be examined on the basis of methodological aspects. Nor does confrontation with the preferences of interest groups mean that the appropriateness of the respective values has been examined in any depth. By contrast, citizens fora offer a good sounding board for anecdotal evidence and statements from day-to-day life which result from observations or moods. The problems of the competent selection of statements and claims are, therefore, the main thrust of criticism levied at planning cells, too.

6.3.3 Consensus conference

The consensus conference model is another innovative method for integrating judgements by lay persons on environmental, health and consumer protection issues into political decision-making processes. The consensus conference consists of the following structural characteristics:

1. The discourse organisation looks for people via a newspaper ad who wish to participate as lay persons in a consensus conference on a specific subject. Between 10 and 15 people are selected from the interested persons who respond to the ad. In terms of age, gender, education and range of occupations they more or less correspond to a cross-section of the population.
2. The selected participants in the consensus conference are given extensive material on the question at stake. The material consists of background reports, newspaper cuttings, expert opinions by the players and other relevant information.
3. During two weekends the members of the consensus conference meet for preparatory meetings. At these meetings they exchange their impressions, focus on the main problems, formulate questions for the experts and select experts, with the help of the discourse organisers, to whom they wish to put their questions.
4. The consensus conference is staged on three consecutive days. On the first day the participants put their questions to the invited experts. This is like a classical hearing; the questions are exclusively placed by the participants in the consensus conference. The hearing is public. It is expected that the legal decision-makers (for instance parliamentarians) are present as silent observers. On the morning of the second day the question session can be continued and questions from the audience may be permitted. In the afternoon the members of the consensus conference come together and prepare a short report with their recommendations. On the third day these recommendations are given to the experts. At a public meeting the experts may provide further information (for instance on factual mistakes or inadmissible generalisations). However they are not entitled to correct or amend the report. The participants in the consensus conference have another opportunity to fine tune the recommendations in the light of their discussions with the experts. Late in the afternoon of the third day the results are made public and explained at a press conference.

The individual steps in a consensus conference can be further extended or amended. A major component of each consensus conference is the involvement of lay persons as experts in the assessment process and the public hearing with the inclusion of the media and the politically minded public. The procedure was used mainly in Denmark by the National Board of Technology for problems in regulating genetic engineering, motorised road transport, integrated agriculture, information technologies and risk analyses of chemical additives in foods. Similar procedures have been used in Norway, Sweden, the United Kingdom, France, Switzerland, Japan and the USA.

Consensus conferences have proved to be a robust, time-restricted and cost-effective variation of discursive decision-making. Prior experience with this tool can mainly be deemed to be positive according to an empirical study by Simon Joss. However, there are a number of problematic points. Participants are chosen using two selection criteria: "self-selection" by responding to a newspaper and "external selection" based on representation criteria by the organisers. Given the low number of selected participants, this is certainly not a representative cross-section of the population. Nor do the advocates of this procedure claim this. Whether, however, the desired heterogeneity in the composition of the participants is sufficient is questionable despite the best efforts to make a fair selection. Secondly, the influence of individual people cannot be underestimated in a small group. Depending on the composition of the group, the results of the recommendations will be scattered. Hence the legitimisation power of recommendations, particularly in the case of far-reaching collectively binding decision, is difficult to judge. This was also one of the main problems of the first national consensus conference on genetic engineering which was organised by the Hygiene Museum in Dresden.

6.4 Discussion of the innovative methods

Irrespective of the discursive method chosen for the task or problem, they all promise an improved carry-over of the values and interests of the population into the decision-making process. In this way they also promote greater, more targeted consideration of the lay perspective in the shaping of environmental, health and consumer protection policies. However, they are not at all panaceas for overcoming the legitimisation problems of official politics or other control systems. If the systematic knowledge of experts is not adequately integrated, then there is bound to be disappointment about the ensuing consequences of one's own incompetence in factual issues. If everything is oriented towards a consensual solution, the discourse is often reduced to trivial platitudes. It is true that these advantages can partially be overcome through skilful structuring of the procedure however participative discourse can rapidly reach its boundaries when it is only staged to conceal no longer stoppable losses of credibility of the risk-regulating agency or the expert groups.

When it comes to solving multi-layered political problems, like those in the field of risk assessment that are not based on statutory provisions, what is normally needed is a mixture of different control and communication methods. Neither the experts with their technical understanding nor the stakeholders with their values can claim sole legitimacy for risk assessments. The innovative methods of involving the general public are particularly to be recommended when a decision on risks affects the interests or values of the individuals or groups concerned to a major degree and when the risks and benefits of an activity are very unevenly distributed throughout the population. The Danish Board of Technology has chalked up positive experience with consensus conferences in conjunction with determining the residual risks of chemical additives in foods.

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7 The use of risk comparisons

7.1 What are risk comparisons and what can they achieve?

Risk comparisons can be used to improve the power and information value of quantitative risk characterisations. Risk comparisons endeavour to establish a link between a risk situation, which the stakeholders do not comprehend, and familiar but also risk-related events. Comparative risks are selected which stem if possible from the (daily) experiences of the stakeholders. The goals of risk comparisons are

- to present or improve the transparency and understanding of the risk situation;
- to promote willingness to critically examine the risk situation;
- to reduce the risk of distraction and to contribute to the appropriate assessment of risks;
- to offer a foundation for acceptance decisions;
- to extend the normative foundation for acceptability decisions (limit values).

The numerical presentation of the probable occurrence of risks can be helpful for risk communication. Care should be taken to do this in a comprehensible manner tailored to the addressees' powers of imagination that does not require them to do any mental arithmetic. This kind of presentation can help to illustrate events that are difficult to comprehend and move them closer to people's own ideas.

An isolated depiction does not really help the decision-making process. This is only the case when dealing with probable occurrences that can be easily grasped by the addressees, e.g. when the orders of magnitude depicted correspond to their daily experiences.

A relative depiction may help with orientation, e.g. a comparison with the probable occurrence of another risk-related activity. In this context risk comparisons assume that a risk is accepted when the calculated probable occurrence times the damage volume is not greater than the calculation of an already accepted risk. This "objective" approach could then lead to the demand for all risks to be classified as acceptable whose risk calculations are not higher than for risks already accepted in day-to-day life. One example can be used to demonstrate this: a risk comparison would probably fail if one tried to convince someone, exposed to the health risk of smoking, to accept the far smaller health risk of proximity to a mobile phone transmitter.

In practice risk comparisons frequently fail despite the supposed risk balance. This is particularly the case when other risk-relevant factors (e.g. voluntary risk assumption, controllability, level of benefit, personal experience) are not taken into account in the comparison and are left to subjective judgements.

Risk comparisons use risks which are reduced to a few characteristics (e.g. concerns, e.g. individual vs. group or population). Sometimes the selection decision made is also reflected in the application; experience however indicates that there should be no high expectations of success and that caution should be exercised when using risk comparisons.

7.2 In which situations can risk comparisons help?

Risk comparisons are frequently used in communication when there is a demand for simple, easily understandable statements which can be applied to daily experience. The following situation illustrates what is meant by this where a member of the audience at an information event stands up and asks:

"Let's leave the scientific statements aside for a minute and ask ourselves: can we continue to eat food A without being worried or not?"

Regardless of whether there is a lack of time, of a willingness to learn, of prior understandings or of whether there are different cognitive structures, values and interests or the inability to further break down the complex nature of the risk situation, at some point or another a need arises in communication for simple answers. Sometimes communicators also give in to the temptation of trying to simplify risk situations which are highly complex, ambiguous and uncertain by resorting to well-meant escalations. Although this is understandable, it should not be forgotten that risk comparisons may also have effects which impede further communication.

7.3 Risks involved in the use of risk comparisons

Perception of the violation of individual situations
If situations are used in risk comparisons which are not accurate in the opinion of the addressees, then the desired impact of comparisons of this nature is questionable. Risk comparisons of voluntary actions with involuntary ones are very unlikely to succeed e.g. "the health risk from air pollutant A is lower than the health risk from smoking".

Perception of the suspicion of misleading information
Risk comparisons in which the extreme values of risks quantifications are played down by indicating average values or in which different measurement units are used may trigger suspicions of playing down the risk or misleading people. The numbers in comparisons are perceived more readily and in a more lasting manner than the related measuring units. Hence the perception of larger differences in numbers could mislead people to thinking there is a larger "safety margin", e.g.:

"More recent studies indicate that the typical air contamination from a laser printer is less than 0.01 mg ozone/m³. The maximum emission concentration (MEC) (German MIK) for ozone, where there is no health risk, is 120 µg ozone/m³.“ [Federal Environmental Agency, 1998]

A similar perception or even the suspicion of manipulation could arise when selected reference values are not accepted. For instance depending on whether the number of fatalities is referred to the distance covered or the number of journeys, the transport mode rail or air will "look better".

Perception of the suspicion of playing things down
Comparisons are also problematic in which risks of a natural origin or risks which society has already grown accustomed to, are used, e.g.:

"The intake of natural pesticides by human beings is higher than that of synthetic pesticides."

"Air contaminant A causes fewer cases of cancer than natural radiation from geological radon.”

"The air contamination from pollutant A is lower than from pollutant B which has always been accepted by the residents.”

"The concentration of chemical C in the river Elbe corresponds to the concentration you would get if you were to dissolve a sugar cube in a milk tanker."

Perception of the violation of concernedness or privacy
Risk comparisons endeavour to produce pictures by depicting an abstract situation. These pictures, in turn, may generate associations in the addressees' minds which hurt their feelings or values because they are personally involved. This can nip any willingness to take a critical look at the risk situation in the bud, e.g.:

In communication with parents: "In moves to remove asbestos from schools, saving a human life would cost X euros whereas improving mobile health services could save a person's life for a fraction of that amount."

7.4 Risk comparison approaches

Generally speaking, it is difficult to predict the "prospects of success" of risk comparisons. Nevertheless, experience shows that the prospect of contributing to successful communication also depends on the reasons for the risk comparison. If, for instance, the aim is to illustrate the order of magnitude between measured and statutory levels of pollutant concentrations, a comparison will normally be successful if people are familiar with the reference values. The following table presents various intentions linked to the use of risk comparisons with decreasing prospects of success.

Table 1: Use of risk comparisons

Intention	Comparison, e.g.	Conditions for success
Orders of magnitude of numbers	Comparison of probabilities of occurrence or exposures	If reference values and reference units can be found which the addressees are familiar with
Create orientation in a hazard situation	Comparison of acute exposure and standard values (e.g. limit values)	If addressees accept the standards institution or the standard value (convention!)
Create awareness for a (possibly already accepted) risk	Comparison of a risk with another (risk-risk comparison)	If accepted risks similar in structure to the perceived risks of the addressees can be identified
Present the cost efficiency of risk-reducing measures	Comparison of costs for risk-reducing measures with those of another risk	If the compared risks have the same damage dimension
Illustrate the scientific quality of risk assessments	Comparison of data qualities of different risk assessments	If quality characterisation is accepted and differences in scientific quality are immediately understandable
Highlight the benefits linked to taking a risk	Comparison of the benefits linked to a risk (risk-benefit comparison)	If the perception of compensation ("letting yourself be bought") can be avoided and the benefits are beyond any doubt
Illustrate remaining uncertainties	Comparison of scenarios	If a plausible and familiar form of illustrating uncertainties can be found for the addressees
Illustrate the undesirable nature of all available management alternatives ("no pain, no gain")	Comparison of action options	If the addressees can assume the role of responsible players mentally or really without any effort and inner resistance

7.5 Practical instructions for the use of risk comparison components

The prospects of success of risk comparisons can be improved by bearing a few points in mind. This reduces the risk of the communication partners not understanding or misunderstanding the communication or even taking on board unintended interpretations.

1. Present the dimensions in a fair manner. For instance use the same units!

	Measured concentration A	Approved concentration B
Instead of	0.01 mg ozone/m³	120 µg ozone/m³
Better	0.01 mg ozone/m³	0.12 mg ozone/m³

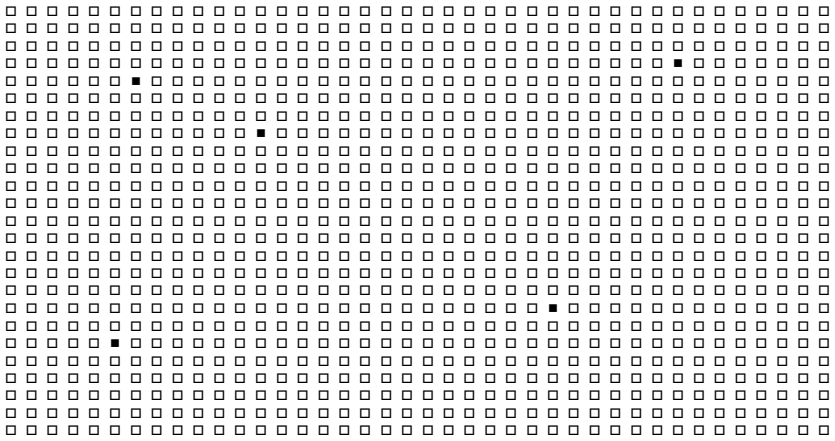
Avoid a possible interpretation by the communication partners that a larger number (here: 120) could misleadingly indicate a larger safety margin than when using the same units (i.e. then only 0.12).

2. Present the numbers in a transparent manner!

   a) Either using clear language e.g.

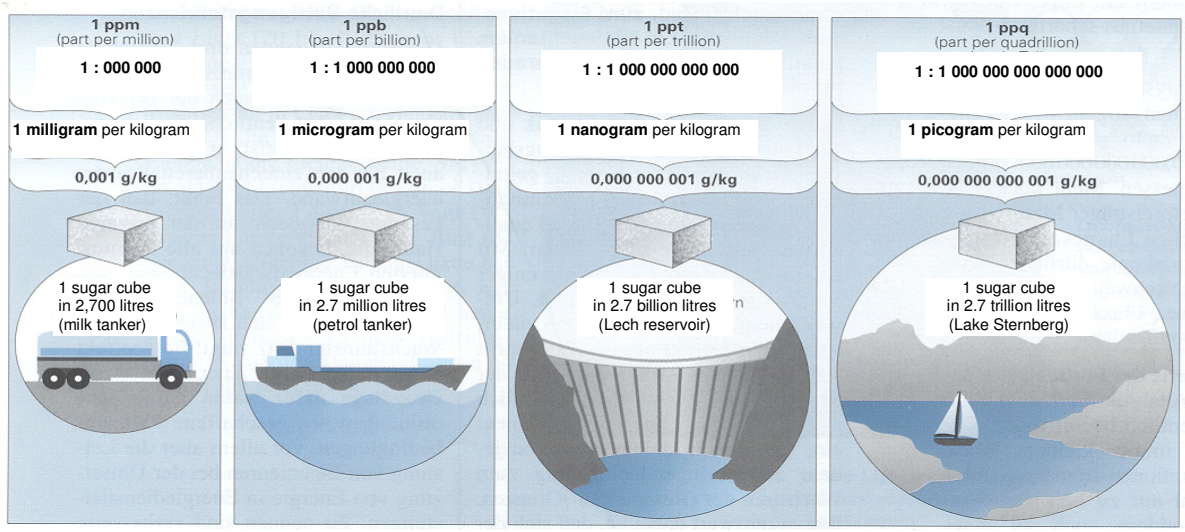
Instead of	... a likelihood of 4.78 • 103
Better	... affecting around 5 out of 1000 people

   b) or a clear image, e.g.



- … “affecting around 5 out of 1000 people“
- e.g. “concentration differences between ...“

Fig. 8: One way of illustrating dimensions



(Source: Gesellschaft für Strahlen und Umweltforschung, Neuherberg. In: Standpunkt 7/1994)

3. Compare risks whose scientific basis (data quality) is comparable!

   It makes a difference whether probable occurrences are determined in a deductive manner on the basis of past observations or in an inductive manner, on the basis of model calculations and extrapolations or on the basis of the arithmetic linking of the probable occurrences of individual events (e.g. fault tree analysis).

4. The intention of risk comparison should always be clearly indicated at the start. Comparisons are mostly undertaken when the intention is merely to illustrate orders of magnitude and the least frequently when they are to serve as justification for the call for acceptability (see Table in Chapter 7.4). The efficacy of comparisons mainly depends on the context of the risk, the situational conditions and the prior attitudes of the addressees.

   "The risk of lung cancer from asbestos in conjunction with lifelong exposure in respiratory air of 1000 fibres/m³ (= statutory limit value for the general population) can be equated with the risk of developing lung cancer from smoking 3 cigarettes a year."

   This statement says even less about whether the asbestos standard is acceptable as exposure in this case, unlike smoking, is largely involuntary. Nor does it give the exposed person any individual benefits which is, at least, subjectively the case for smoking. Hence this comparison merely intends to illustrate the level of risk from asbestos when complying with the standards.

5. Use risk comparisons in which comparisons of management options are undertaken where the level of benefit or damage is if possible of the same dimension (for instance specific health damage in the case of alternatives offering the same benefits).

   "The risk of cancer as a consequence of exposure to air pollutant A is half as high as the risk of contracting cancer from exposure to air contaminant B."

   "The amount of hydrocarbon emitted during the generation of one kilowatt hour of electrical energy using energy production technology A is twice as high as that with energy production technology B."

   "The use of respiratory mask A reduces the risk by 50%, the use of respiratory mask B by as much as 80% compared with the risk when no respiratory mask is used."

6. Avoid comparisons in which direct risks are compared with indirect benefits!

   For instance the following comparison would not be suitable for reducing the perceived risk from chemical C: "Chemical C can under certain circumstances trigger skin cancer in 1 out of 10,000 cases of people exposed to it. By contrast it should be borne in mind that the use of this chemical to sterilise surgical instruments saves the lives of at least 1,000 people."

7. Compare the various estimates of the same risk by competent assessment institutions. This illustrates the range of risk assessments. Comparisons of this kind help to counteract the impression of fundamental dissent in science and, at the same time, to render the plurality of estimates plausible.

   "The risk assessment by the experts at BfR produced result X, the experts from the EU working group came to the conclusion Y, WHO Institute established result Z."

   All three results are in a narrow range from X to Y (Z is between them). Hence we can expect at worse X, at best Y number of cases.

8. Use risk comparisons with risk characteristics which correspond to the experiences and perceptions of the addressees. Avoid using harmless but graphic products in conjunction with toxic substances (see on this Fig. 8 in Chapter 7.5. "Sugar cubes").

   In a PVC paddling pool a low amount of PVC products may indeed be released into the water. The question is: Is this dangerous for the child? In order to reach the TDI, i.e. the tolerance value established by the health authorities (for a one-year-old child with a body weight of 10 kg the TDI value is 500 microgram), the child would have to drink more than 150 litres of the water every day. Under these circumstances there is no real threat to the child but you, the consumer, are of course free to decide to do without PVC products even when there is no real threat. By contrast, the legislator must orient his decisions towards objective health risks.

7.6 Practical instructions for the communication of risk comparisons

- Do not stubbornly maintain that your risk comparison is correct but accept a situation in which your addressees reject the comparison.
- Do not try to convince addressees with risk comparisons that the "logical" thing for them to do is to accept a risk. Do not necessarily conclude that the risk would be accepted even if your risk comparison met with a positive response.
- Be diverse. Try for instance to offer several comparisons for a common damage dimension.
- Be inventive. For an intended comparison try to use several risk comparisons from various contexts, "images".
- Risk comparisons should support but not depict your central message.
- Do not use any risk comparisons if you have the impression that people do not trust you.
- Test the impact of risk comparisons beforehand if possible with people from your addressee group.
- Successful risk comparisons are a question of good craftsmanship but frequently also a matter of luck.

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8 Training programme

One major project goal of ERiK is to provide assistance in anchoring the functions and intentions of risk communication in the respective departments of public agencies. To this end a training programme has been developed which is available as a CD-Rom in German. Initially the model-based training programme seeks to raise awareness amongst participants of the need for and functions of risk communication. It is not about merely imposing a risk communication model via the training programme on all federal agencies. It is far more the case that the training programme should provide an incentive to take a critical look at each agency's self-understanding and in this way to highlight the relevance of successful risk communication for the agency's work. That is why the same emphasis was placed on the option of self-training which can be individually dosed in terms of time and content at the workplace and on opportunities for interactive use. To this, end interactive interfaces with routing functions were created for the desired theme areas as well as the possibility to input personal assessments and preferences. Besides individual use the training programme can also be used as the basis for group training with an additional trainer or coach.

The training programme is intended for existing or new staff members of public agencies on the federal state and regional levels who bear responsibility for risk regulation or who communicate with experts, politicians, representatives of other agencies, social organisations, media or the public at large. The users of the training programme are to be introduced to the opportunities and risks of risk communication, given incentives for the orientation of their own risk communication activities and offered an opportunity for a dry run.

The structure of the training programme moves from the general to the concrete whereby it is possible to move sideways at any time in the programme or to exit programme sections. Besides a section on "What is risk communication?" the main contents of the training programme focus on the topics model, tools and checklists. First of all the users can run a rapid test estimate the need for risk communication in their own agency work and obtain contextual instructions on how to formulate their own model. The next step involves using communication scenarios developed within the framework of the programme as the framework for the choice of proven risk communication tools. In order to facilitate the use of the proposed instruments, several checklists have been drawn up as user-friendly implementation aids for the scenarios. Direct Internet links facilitate more in-depth study. The user instructions and an introduction to the training programme are an integral part of the CD. When you open the CD these aids automatically appear.

9 Evaluation

9.1 Need for evaluation

The actual implementation of risk communication decides, in the final instance, on the achievement of the desired goals. It is, therefore, essential to evaluate risk communication in order to assess its effectiveness. The evaluations should be an integral part of any risk communication programme.

During evaluation the contents, procedures and consequences (results and effects) of risk communication activities are scientifically assessed using specific criteria with regard to the previously specified goals. The risk communication programme discussed here touches on highly relevant social topics like health protection and central safety needs. For that reason alone there is a need for an evaluation of the communication efforts if success is not to be left to chance. However, common sense or subjective individual opinions are not enough. Intuitive efficiency assessments are misleading because of selective and mood-driven perceptions. For that reason a systematic and empirically backed approach is essential. In order to ensure the implementation of the risk communication models, there is a need not only for scientifically backed but also ongoing evaluation along the lines of quality management.

Not only can an evaluation highlight whether and, if so, to what degree the desired goals have been achieved but also which elements in the risk communication programme have contributed to achieving or failing to achieve the desired goals. A strength-weakness analysis of this kind can also be used when a decision has to be taken about continuing or abandoning the programme or looking for an alternative.

An evaluation also serves to justify the costs and resources needed for a comprehensive risk communication activity and to peg out the foundations for efficiency considerations. At the same time, a report must be given about the extent to which the communication corresponded to the needs of the players. In this way evaluation creates the empirical foundations for optimising the risk communication programme by providing a basis for a decision on the setting of priorities within the diverse range of possible combinations of tools.

The evaluation should be conducted by external experts or by trained staff members who are experienced in putting together questionnaires, carrying out surveys, dealing with preconceived ideas or evaluating different data material.

A good evaluation is comprehensive; if possible it takes the contributions of all players into account. Ideally, the assessment of the evaluation not only looks at the actual results but also its unintended effects. Here the evaluation can concentrate both on the observation of internal and external effects. Good evaluation need not necessarily be complicated. What is important for compliance with a given cost framework are clear ideas about the goals to be achieved by the evaluation (cf. also more particularly Chapter 9.3).

An evaluation is interested in future-oriented, constructive recommendations for improvements and not in destructive criticism of the past. What is necessary here is the willingness of all stakeholders to submit their performance to critical observation. All players should be interested in constantly improving communication.

The evaluation can also contribute to promoting the willingness for steadily improving communication. An evaluation should be announced in advance to all players. It must be clear to everyone who is to be evaluated, what is to be evaluated and the scale of the evaluation.

9.2 Evaluation within the framework of quality management

During evaluation all processes, means and methods of the evaluation process are depicted in a user-friendly and plausible manner. In this context, the requirements to be met by quality management systems (QM systems), like those specified for instance in the group of EN ISO 9000 (formally DIN EN ISO 8402: 1995 Total Quality Management), EN ISO 9001, EN ISO 9002 etc., may be helpful. Here a process-oriented approach is assumed in which the focus is placed on "constantly improving the process on the basis of objective measurements" (EN ISO 9001: 2000, p. 12).

The introduction of a QM system is to be seen as a strategic decision by the institution management. Its concretisation largely depends on the changing requirements, the chosen goals, the resources provided, the methods used and, last but not least, the size, structure and prior history of the institution itself. That's why, there are also major differences between QM systems; nor is standardisation desirable.

If one sees risk communication as a client-oriented service, then the requirements to be met by QM systems can be transferred in the following way to the requirements to be met by an evaluation programme for risk communication:

1. Acceptance by and responsibility of management:
   - Has the risk communication programme been proactively initiated by management and has its importance and validity for all areas of work been communicated?
   - Have the resources needed for the implementation of the model been provided?
2. Staff knowledge and competence:
   - Have all staff members understood and accepted the risk communication model?
   - Do staff receive initial and continuing training in the risk communication programme?
3. Performance of risk communication activities:
   - Is the quality of risk communication activities systematically measured using the guidelines and evaluated in terms of strengths and weaknesses?
4. Observation of the impact of risk communication activities:
   - Are the results and effects of risk communication activities constantly monitored?
5. Ongoing improvements to the risk communication programme:
   - Based on the results of performance measurement and impact observation, is there a regular review of the risk communication programme and training programme?

9.3 Instructions on carrying out evaluation

First step: Specify goals

Specify assessment goals; they may focus either on the content of communication, the procedure itself or the assessment of results.

a) Content orientation: Assessment of the communication contributions of all players and the communication method, e.g. for correctness and validity of the statements (see below).

b) Procedure orientation: Assessment of the selective framework/setting and the procedural instructions concerning optimisation and further development.

c) Result orientation: Assessment of effects, e.g. effectiveness, efficiency and credible implementation of the measures.

Second step: Specify format and design of evaluation

- Who are the communication partners (addressee groups)?
- Which control groups are to be selected in order to demonstrate that observed effects are indeed the consequence of risk communication activities and not the consequence of other influences?
- How can proof be provided that the risk communication activity has not had any unintended consequences?
- Which tests (preliminary tests, repeat tests) are to be conducted?
- Resource planning (time, money, ...)
- Random sample examination
- Supervision of the overall process
- Evaluation of sub-processes

Third step: Specify criteria

Once the assessment goals (see above) have been specified, the criteria must be determined in order to have a normative foundation for "success" and "failure". The main criteria can be:

a) Content orientation

- Significance: Were the statements for the topic significant (significance test: many statements on the subject are compared with one another. If a common mean value is found, then is this helpful when assessing the individual statements?)
- Validity: Evidence typology, to be clarified in inter-personal contacts, can the interpretation in fact be derived from the data? To what extent can the derived interpretations be applied in general?
- Topicality: Criticism of sources using the publication dates

b) Procedure orientation

- Setting: What hierarchy situations are there? What is the atmosphere like? What are the prevailing understandings of roles?
- Players: Who are the players? Who are the receivers and the senders?
- Course: What was the previous situation like? Are there alternative information and communication strategies? Analysis of the methods used

c) Result orientation

Effectiveness: Has the target goal been achieved?
Goal: "Attention and awareness of the problem", for instance

- by counting the number of contacts to addressee groups (hearing, reading, seeing contacts, number of contacts to journalists, print run etc.)
- by measuring the remembering of messages, with multiple choices or by yes/no surveys in the case of "is an important subject for me?"

Goal: "Improving understanding and knowledge", measurement of the increase in knowledge through multiple choice questions

Goal: "Credibility and trust", e.g. through guided interviews

Goal: "Changing attitudes and acceptance", survey with scaling procedure (very much agree … very much disagree)

Goal: "Change decisions and behaviour": Survey of the addressee group, what was actually done in order to deal with the risk situation; or examination whether risk-reducing behaviour is really tangible?

Goal: "Process conflicts and risk of crises: Are there signs of a willingness to compromise, is joint conflict resolution evident?

Efficiency: Measurement can be done by cost comparison; compare costs of measures with the costs of the consequences which would have occurred without a risk communication programme, what would an alternative solution have cost?

Sustainability: How far-reaching are the results or effects? How credibly was the result implemented?

Commonalities: Do all players support the result? Have they learned from one another?

9.4 Evaluation methods and instruments

9.4.1 Preliminary analysis, pre-test, focus group

Here the material or the evaluation procedure of the future evaluation programme is tried out in a test group (focus group). In simulations and role plays the effect of the "key message" can be tested. A preliminary test reveals whether there are blockades in the flow of information and how the material can be improved. This can prevent "unpleasant" surprises. The method is effective and highly efficient and should be an essential part of all risk communication activities.

9.4.2 Systematic feedback

Systematic feedback involves obtaining feedback on risk communication activities directly from, if possible, all those concerned. In the case of oral communication assessment sheets and short questionnaires can be distributed or in the case of written communication response forms can be attached (e.g. performance check).

Table 2: Performance check

Performance check	Practically not achieved	Partially achieved	Satisfactorily achieved	Fully achieved	Cannot be assessed because	Need for improvements
Guideline 1		X				Intensify training
Guideline 2			X			
Guideline 3	X					External moderation
...						

This method is extremely cost effective, user-friendly and the results are rapidly available. However, the questions must be carefully couched; there should not be too many and they should permit clear answers. As shown by the following example, the guidelines can also be used directly.

This method also includes the option of evaluating phone calls, letters or press reports. However, it should be borne in mind that these feedback channels can be influenced in a one-sided manner and there will be a disproportionately high number of answers from clear supporters as well as clear opponents of the communication. This one-sidedness should be taken into account when interpreting the answers. This type of feedback evaluation may be particularly helpful when this is undertaken over a longer period in a systematic manner.

9.5 Experimental design

The classical form of experiment design is the comparison test with a control group who were not "exposed" to any risk communication activity (stimulus). This has the advantage of being able to measure the effects of risk communication activities directly and without any possible third-party influential factors. However, the time and costs involved are considerable.

9.5.1 Survey, and interviews

A representative selection of all the people directly concerned are questioned using a guided interview. From the angle of risk communication this does not so much entail surveys by opinion poll institutes which are intended for the overall population but more a survey of an addressee group.

The interviews can be recorded and then evaluated from the qualitative angle (this takes a lot of time however). The interview offers the advantage that it gives the interview partners an opportunity to immediately clarify unclear questions and to identify individual priorities. Here it should be borne in mind that the information provided by the interview partner refers to that person, very much depends on subjective factors and may lead to distortion.

The survey can be conducted at a time which is close to the risk communication activity or repeated after a certain time in order to obtain insight into the sustainability of the information provided or the development of credibility. Ethical guidelines are to be borne in mind.

9.5.2 Chat analysis

Internet chat rooms can be used for various purposes in order to pass on information to consumers, in order to enter into a dialogue with consumers and in order to collect information about one's own performance.

On the Internet participants communicate directly and anonymously with each other in real time like in a forum. In addition to the contents, the written dialogue provides further assessment aids. Software programs permit rapid, comprehensive analysis of the arguments used and the profiles of the participants. The results obtained are limited in terms of their power as the participants merely represent a specific participant circle (computer users). However chat analyses provide a rapid and relatively low cost opportunity for assessment by communication partners.

Experience available up to now can only be drawn on to a limited degree because of its scale and limited comparability. Nevertheless, this is a tool of the future which will rapidly overcome its shortcomings especially concerning the limited circle of participants.

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10 Paths to a new communication culture

The main task of risk communication, this is the conclusion, is to make all interested citizens „capable of making a judgement on risks". This means that everyone should be placed in the position to undertake his/her assessment of risks and to judge for him/herself the appropriateness of the management options. Of course, the relevant findings on the cause of the risk and the related uncertainties should be taken into account.

Risk communication can only meet this requirement if there is clarity about the content and form of the communication. The way in which risks are assessed by politicians and experts is just as important for successful communication as the question about a suitable structure or model on which communication is based.

Successful communication, therefore, begins with a rationally thought through, factual process of risk assessment which is in harmony with the values of society. For that reason special emphasis should be given to the plausible assessment procedures which take account of people's concerns. Above all it must be guaranteed that the inclusion of value judgements, which is also always necessary, is done in a transparent manner and politically legitimised.

The focus of good communication is on the clarification of the situation or the surrounding framework conditions responsible for the different attitudes and assessments. Risk communication rarely triggers dissent directly but it does provide a rational basis to localise and characterise dissent. It is not the task of risk communication to ignore or even standardise the plurality of interests and values in society but rather to use proven tools to achieve mutually agreed solutions to collective problems despite varying preferences in society.

All the same discourse and participation are not a panacea for rational and fair conflict resolution. In each risk assessment process the majority of citizens concerned will remain spectators no matter how open the procedure is and no matter how intense their involvement in public debate. They wish to be informed in an appropriate manner. Given the complex nature of risk assessment, the information processes for the general public are just as high risk as the topics they address. In the concert of experts who frequently contradict each other, sensation-driven media and often opposing politics and given the difficulty of making stochastic statements comprehensible, pure information campaigns are doomed to failure from the very outset. Efforts to change the selection criteria of the media or to convince real or supposed experts to engage in the exclusive staging of their dispute within the scientific arena will not succeed. In future, too, the plurality of claims to truth and the shortening of messages by the mass media are likely to continue.

For that reason interactive forms of communication (despite the organisational difficulties) are to be given priority. Interactive means that the people who do not take part in decisions communicate by means of questions and answers, i.e. in dialogue form, with those who do. To the extent that public debates have taken place during the decision-making processes, there are certainly representative of the one or the other group who are available as credible partners in dialogue. Trade unions like to have representatives of their trade union, environmentalists like association representatives of environmental groups, managers the representatives of industry and the business community as partners in dialogue. It is important that there is a dialogue in which both sides can exchange information and learn from each other. Politicians alone are overtaxed with a programme of this kind. It is far more the case that the groups participating in the decision should actively structure the dialogue using the available communication means.

Furthermore, this is an opportunity to make better use of the new information media. For instance one could set up a clearing house for public risk debates on the Internet. Interested users could obtain the latest information and also put their questions there. It would also be

important for this clearing house to be supported by several groups so that in addition to plurality it can claim legitimisation.

The communication of risks in which either scientific risk assessment (where there is a low degree of uncertainty) or the precautionary principle (where there is a high degree of uncertainty) has priority is also dependent on the receivers of the information being able to understand the logics of the assessment procedure. This will be more and more the case the more they are involved in a communication exchange with the people who undertake these assessments. It would, for example, be advisable to have the experts who undertake risk assessment meet publicly (to the extent that this is possible for legal reasons) or to document their decision-making process on the Internet or in other publicly accessible media.

Besides the dialogue classical PR work is also required. It should, however, be clear by now that the information policy in a pluralist society rarely changes attitudes and can only contribute in a limited way to the rational and value-oriented assessment of risks. Classical PR work should be oriented more towards making the legitimacy of the procedure the actual linchpin of information rather than the results. In classical PR work it is almost impossible to explain to someone why the limit value for ground level ozone was set at X. However it can be communicated in the media why a limit value of this kind was established, which interests were taken into account and how target conflicts were resolved. The reasons for the individual values, by contrast, can only be communicated in a dialogue. The consumer of this process-oriented information either has confidence in the decision-making process (when this information suffices) or he or she engages in a critical dialogue.

Almost as an aside successful risk communication also helps to strengthen confidence in the existing assessment process. You cannot generate trust. Trust has to be earned through corresponding performance and open communication. This is helped by active exposure to arguments and justification to the extent that these are requested. Any move to involve everyone in the dialogue would lead to an overtaxing of the communication system in any society. Placing all your bets on the impact of information is an illusion. It is the right mixture which contributes to the success of communication. In this context the "good" proposals listed in this guide and in comparable publications for the truthful, attractive and comprehensible processing of communication contents are to be taken into account.

Risk communication is not a luxury but an integral part of modern risk management in a democracy. It must, therefore, be firmly anchored in a new and contemporary philosophy of the public agency. Signs of changing public agency awareness whereby communication is not seen as a disruptive burden but as a means for providing services to citizens cannot be ignored. These signs of an addressee-tailored communication policy must increasingly become part of everyday practice in the public agencies. This report would like to make a contribution to making this as effective as possible.

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11 Synopsis

11.1 Study: Development of a multi-stage risk communication process

Reasons for the study
Available studies (for instance Action Program Environment and Health, the final report of the Risk Commission, expert opinions of the SRU (Panel of Experts for Environmental Issues) and WBGU reveal clear deficiencies in risk communication in the environment and health fields (BSE, genetic engineering, food additives, electromagnetic radiation etc.). These studies draw attention to deficits in the conceptual structure of risk communication in both the private sector and in state regulatory agencies as well as in aspects of their carry-over into concrete projects and programmes for communication with the public. Consequently, the project "Development of a Multi-Stage Risk Communication Process" was initiated with the goal of developing a model for participative risk communication. The aim of this model is to help meet the expectations and requirements of the various federal agencies on the one hand and the needs of the communication addressees on the other.

Why risk communication?
Why do we need communication on risks? In democratic societies citizens expect decisions that affect on their lives and health to be publicly legitimised. This is not possible without mutual communication. The goal here is not to convince the other side that a risk is acceptable or unacceptable but rather to enable the citizens concerned to assert their right to "risk judgment capacity" by means of

- information (one-way communication),
- dialogue (two-way communication) and
- participation (opportunity to take part in the preparation and taking of decisions).

The term ‘risk judgment capacity’ implies the ability to make a personal assessment of the risks in question – based on the knowledge of the demonstrable consequences of risk-related events or activities, residual uncertainties and other risk-relevant factors – in accordance with their own criteria or with ethical criteria deemed appropriate by them for society. Recognition of citizens’ risk judgment capacity implies that the risk-regulating institutions are responsible for establishing and nurturing the necessary communication basis. In this process the various forms of communication – from information to participation – have to be regarded as a continuum of increasing intensity and reciprocity between the communicating partners.

Functions of risk communication
Risk communication must be understood as an open exchange of information and arguments. In this context, risk communication has to carry out the following five tasks:

- provision of well-founded information on the state of scientific research on the effects and side-effects of incidents, substances and activities on the environment and people's health;
- coordination between the players as well as informing the population affected about possible protective measures and suitable behaviour (including communicative preparation for emergency measures);
- provision of comprehensive information about the methods used for assessing and evaluating risks (and benefits);
- clarification of the positions of the interest groups concerned;
- provision and implementation of communicative procedures for the problem-driven and democratic participation of various players in the risk assessment process (planning and conflict resolution).

The risk assessment and risk management institutions must see the assumption of these five duties as their central tasks. This applies to both public and private institutions (public agencies, industry, insurance companies).

Risk communication between various players
In a pluralistic society where the pressure to legitimize political action is always high, risk assessments often encounter widespread scepticism and deep distrust. More than other statements, statements on risks must be plausible (i.e. based on intuitively understandable reasoning) and are dependent on trust in the regulatory agencies. Hence, risk communication can only be successful if there is an intense, communication-oriented dialogue with the players and the interested public. In this context, risk communication takes place on many different levels simultaneously. These levels comprise a number of different players like experts in various fields, regulators, politicians, representatives of other agencies, social organizations, industry, associations, the media, multipliers as well as stakeholder groups within the population. Communication also takes place between the various political levels of environmental politics (communities, federal states, federal government, Europe). There are often misunderstandings, misinterpretations and conflicts on all these levels of risk communication. Moreover, the communicative process must not be understood in a one-sided manner. Frequently the people exposed to the risks can supply important information for scientific risk analysis and risk management. Efforts should, therefore, be made to ensure a broadly based, addressee-oriented, reciprocal exchange of information.

Main requirements to be met by risk communication
How can the demand for a broadly based, addressee-oriented, reciprocal exchange of information be met in reality? Successful risk communication begins with a rationally thought through, factual process of risk assessment which reflects the pluralistic values of society. For that reason, special attention must be paid to ensuring understandable, consistent methods of risk assessment which give due consideration to people's concerns. As prevailing attitudes and convictions frequently become entrenched and continue to influence the intake and processing of new information, it is essential to focus on early, proactive and ongoing communication. This kind of comprehensive communication includes:

- clear, timely and plausible documentation of all assessment processes and results including information on the assessment methods and criteria used as well as their factual and statutory bases;
- information on how the suggestions and comments of third parties are taken up and processed;
- information regarding possibilities to participate and raise objections;
- opening of a communication channel for feedback and comments;
- setting up of a "clearing house" for public risk debates on the Internet where interested users can access the latest information on risk regulation (including preventive measures) and also ask their questions.
- information on public events or dialogues on the risk in question;
- information on literature and other expert opinions.

It is essential for communication with the participants and the public to be based on generally known terms and familiar concepts. Above all, technical terms must be used unambiguously. If the term "standard" has various, very different meanings, then confusion and irritation are bound to happen. For this reason, information must be put together and formulated in a target group-oriented manner. Risks must also be seen in the overall context of risk-benefit analyses and the ensuing containment of other risks. The key terms and concepts of risk assessment, evaluation and management should be used in a standardised manner in all

institutions dealing with risks. They should also be used in this way for external communication. Here it is particularly important for terms and concepts to clearly reveal the degree of hazard, the entire context and the persons or items to be protected.

Need for participation
The larger the number of individuals and groups that have an opportunity to actively participate in risk regulation, the more they are likely to develop trust in the risk regulation institutions and also assume responsibility themselves. However, participation cannot and must not be a substitute for effective and timely risk management. It should accompany the prescribed regulation processes. Above all, the participation process should not obscure or diminish the responsibility of legal decision makers. Participation within the framework of collectively binding regulations serves to prepare and help decision-making processes but not to place responsibility on many different (if possible anonymous) shoulders.

Even although participation in risk regulation does not include decision-making powers for the participating groups and individuals, it should still not be restricted to the mere mutual exchange of information. This applies to both risk assessment (scientific appraisal) and risk management. Here it is important that normative assumptions and values are also incorporated into the risk assessment process, albeit it on a lower scale than in risk management. Above all, the definition and interpretation of the protection goals and objectives, the specification of assessment conventions as well as definitions of adverse effects and the choice of target parameters for risk assessments are shaped at least in part by social and political goals. Hence, the timely and mutual participation of social players in the risk assessment phase itself is both technically appropriate and democratically imperative. In the risk management phase where normative assumptions and values play a key role, effective participation helps political decision-makers to secure greater legitimacy in the decisions made by them, thus contributing to the democratic culture of a country.

Five stages of participation
Depending on the situation, type of risk and phase of the regulatory process, different stages of participation are required (individual or in differing combinations). Basically, all the people who are directly or indirectly affected by the consequences of a decision, i.e. the people whose interests or values are positively or negatively influenced, should be included in the participation process. Overall, the following basic types of participation can be identified:

1. Risk communication within a public agency (participation stage 1):

   This stage involves the participation by experts from public regulatory agencies. It refers to experts from various special departments or working groups within a public agency who assess a risk source from various perspectives or with a different focus (e.g. different end points like toxicokinetics, acute toxicity, carcinogenicity, ecotoxicity, ...). An important goal of stage 1 risk communication is to break down hierarchical disciplinary and technical behavioural patterns that can interfere with the communication process, especially when historical analogies or in-house rules are advanced as arguments ("We have always done it this way"). Usually the starting point of risk communication is an initial written draft of a scientific risk assessment. The structure used therein provides a framework for the subsequent discussions, thereby increasing the effectiveness of communication. In this process the desired goals must be clearly stated, the sources of data and arguments made transparent and the conclusions drawn from them presented in a plausible manner. Assumptions and speculations must be indicated as such. Communication will be even more effective if the arguments used to draw the conclusions are clearly indicated (like a leitmotif).

2. Risk Communication between public agencies (participation stage 2):
   If risk regulation falls within the portfolio of several regulatory agencies, the representatives of these bodies must be included. Players on this 2nd level may come from public agencies with varying territorial or functional competences (e.g. consumer protection, safety at work, ecotoxicology ...). The most important task here is the comparison and expert commentary of the data and the conclusions drawn from them. It is not about standardising but about avoiding inconsistencies, e.g. due to overlapping or missing competences. As a rule, the starting point of risk communication in stage 2 is also a written draft, which can be discussed orally – as in stage 1. The communication requirements for inter-agency communication are similar to those for stage 1.

3. Risk communication with external experts (participation stage 3):

   This stage focuses on communication between experts in public agencies and external experts or scientists. If, for example, it emerges in the first or second stages of participation that a clear risk assessment is not possible, then it makes sense to bring in external experts. The choice of experts should reflect the whole range of prevailing scientific opinions, cover if possible all relevant disciplines and give priority to independent individuals. The main goal of stage 3 risk communication is to contribute to a comprehensive clarification of the risk situation and to differentiate between higher and lower levels of uncertainty in knowledge required for this clarification. Here it is important to broaden the knowledge base as well as to consolidate the conclusions in the risk regulation process. In order to achieve these goals, discursive workshops, Delphi surveys or scientific consensus conferences can be used as participation tools.

4. Risk communication with stakeholders (participation stage 4):

   Frequently the reason for the lack of social acceptance of risk regulation measures is not that the public agency had ignored or not adequately considered available knowledge. It has do to with the issue of determining goals and levels of protection and setting priorities when faced with conflicting protection objectives. Thus, stage 4 risk communication focuses on varying values and weighing up criteria, which may differ widely in a pluralistic society. For this reason, the earliest possible participation of stakeholder representatives is imperative in the preliminary analysis stage, i.e. when determining protection goals and levels as well as priorities. Here the objective is to:

   - obtain special knowledge and experience from circles of risk initiators and stakeholders;
   - improve mutual trust through transparency of arguments and two-way communication;
   - draw attention to conflicting goals in the normative assessment of the risk as well as when weighing up the advantages and disadvantages of various management options;
   - include the interests and values of the relevant interest groups in order to avoid causing unnecessary offence.

   The groups who can participate in this discourse can be: risk initiators, delegates of organised interest groups like representatives of industry, unions, associations, nature conservation organizations or autonomous players (WHO/FAO, EU, government representatives on the federal government/regional states, specialist agencies, political parties). Stage 4 risk communication focuses on improving mutual trust and concentrates on exchanging risk-relevant information (latest findings, interpretations, conclusions, assessments). What are helpful here are forms of communication that facilitate understanding of the other side's point of view and background. They include the submission of evidence, interpretations and assessments as well as agreement on how to proceed further. Ideally, risk communication should be able to reveal how the interests and concerns of the stakeholders can be carried over into the regulation process. The possible (economic or

social) disadvantages for individual groups resulting from decisions based on careful consideration of the issues should be made transparent and the need for them plausibly explained. In stage 4 instruments like round table discussions or mediation processes can be used.

5. Risk communication with the general public (participation stage 5):

   Communication with the general public is particularly problematic as the “general public” is a construct consisting of many non-organized groups without directly addressable representatives. At this stage, risk communication methods are more diffuse and riskier than those in stages 1 to 4. Despite these restrictions, there are important reasons for actively including the general public in risk communication. This can fulfil the following relevant functions:

   - Including everyday knowledge that supplements expert knowledge or encourages additional justification;
   - Extending the issues to be considered and the items to be protected;
   - Illustrating the weight of the concerns voiced by citizens exposed to the risk (weighing up of conflicting goals);
   - Increasing the willingness to tolerate painful trade-offs if the reasons can be discussed intensively with the decision makers;
   - Increasing the willingness to forego legal action because of involvement in the decision.

Risk communication with the general public should be initiated early on, i.e. during the preliminary analysis stage mainly in the case of risks that trigger controversy in society like health risks linked to genetic engineering or risks caused by electromagnetic radiation. This touches on fundamental questions of the acceptability of these risk sources as every member of society is affected by them. Moreover, stage 5 risk communication must also consider risks for which there is no scientific threshold value and acceptability limits must, therefore, be established. A comprehensive social discourse is needed in order to determine which risks are acceptable. Discourses of this nature are also necessary when the consequences of risk regulation measures have economic repercussions far in excess of the normal level (e.g. costly protective measures against terrorist attacks).

In this participation stage, newer tools like citizens' consensus conference, citizens' fora and future workshops can be used in addition to the classical tools like hearings, panel discussions and public group meetings. Moreover, public risk communication should include media-based tools (brochures, written pamphlets, information videos, telephone hotlines, Internet websites, active internet forums, moderated chats, ...) and "event-oriented" tools (presentations, exhibitions, educational fairs, visits to schools, "make-it-live" excursions, talk shows, open days, excursions,...). These high impact tools provide an opportunity to reach even those people who have been critical of classical information tools up to then.

Role of public relations work

Apart from dialogue-based methods, there is still a need for public relations. But it should be clear by now that in a pluralist society a policy of mere information dissemination can rarely change opinions and can contribute little towards rational, value-based risk assessment. Classical public relations should, therefore, aim more at making the legitimacy of the process the linchpin of its information communication rather than the results. In classical public relations hardly anyone can understand why the threshold value for ground level ozone has been established as X. However, the media can explain the reasons behind the threshold value, the interests considered and how conflicting goals were settled. Consumers of this process-oriented information either have faith in the decision-making process (then this information

will suffice) or they will embark on dialogue-based critical discussion. Risk communication must, therefore, comprise a wide range of information, communication and participation offers which – when effectively coordinated – all serve the above goal of promoting people's capacity to judge risks for themselves.

Institutional requirements

The addressees have high expectations of risk communication. The starting position of the communicating public agency is not easy. The staff of public regulatory agencies face increasingly emotional reactions, growing pressure to justify themselves and a new dimension to risks. They are forced into a reactive role and must deal with ongoing dissent, uncertainties and a widening scope for action in the assessment process. At the same time, they are expected to fulfil these ever higher expectations with a shrinking staff and lower costs. Communication programmes and internal structures must adapt to these new conditions. How can institutions succeed in this?

Risk communication cannot be done "in passing". It needs to be integrated into the organisational structure of the institutions involved in risk assessment or regulation. It is essential that risk communication be firmly anchored in the risk assessment and risk management institutions and that risk communication experts to be recruited onto the teams of risk analysts and risk managers. Moreover, the participating scientific risk analysts and risk managers must be equipped with the communication skills needed to exchange their approaches and results among themselves and with the other players and to present them to the general public in an understandable and plausible way. It is, therefore, recommended that initial and continuing training courses and exercises are regularly organised for the players from industry, insurance companies and regulatory bodies.

A communication programme on this scale exceeds the institutional capabilities and resources of most regulatory bodies at the federal government and federal state levels. In its final report in 2003, the ad hoc commission "Reorganization of the Processes and Structures for Risk Assessment and the Setting of Standards in Health-Related Environmental Protection of the Federal Republic of Germany" therefore suggested setting up a separate service agency to assume the above-mentioned tasks for all higher federal agencies (and regional agencies, if desired). The recommendation of the Risk Commission reads as follows:

"The appropriate participation of social players in the decision-making process is imperative on technical and democratic grounds since the definition of the protection goal, the laying down of conventions when assessing, selecting and weighing up risk-reducing measures are determined by social and political objectives… Risk communication is to be seen as an integral component of the entire regulation process starting in the preliminary phase of regulation right through to the implementation of measures. All risk communication efforts should be timely, comprehensive and reflect the stakeholders' concerns. A service facility unit for risk communication for all institutions and public agencies should be set up to implement the communication and participation guidelines".

It was not just the Risk Commission that proposed and recommended intensifying risk communication. Similar recommendations were made in the final report of the von Wedel Commission, in the 1992 Report of the Berlin Academy of Sciences, in the 1999 SRU Report, in an expert opinion of the European Academy in 2000 and in the annual report of WBGU in 1999. Hence, scientists and expert bodies are voicing a clear demand for the improved and more effective integration of risk communication into regulatory practice. Risk communication must, therefore, been seen as a major cross-sectional task of all risk assessment and risk management institutions. The most important recommendations for achieving this goal are summed up in the following section.

11.2 Recommendations

Process-related recommendations

a) All federal agencies that assess, evaluate and/or manage risks must see risk communication as a central task of their service. Risk communication is more than just public relations work about the activities of an agency. Risk communication should enable citizens to assess risks on the basis of existing technical knowledge and their own values and to draw their own knowledge-based conclusions on how to deal with these risks in the future. Here, the emphasis is firstly on how to avoid or manage those risks which one can influence (like diet, leisure risks, some traffic risks) and secondly on how to push for collective forms of control that help to bring about the desired degree of risk reduction provided the reduction or avoidance of risks is dependent on action by the state.

b) Risk communication must be seen as an integral part of the overall regulation process that begins in the preliminary phase of regulation and ends with the execution of measures. All risk communication efforts should be timely, comprehensive and reflect the stakeholders' concerns. The following tasks should be carried out by the regulatory agencies themselves or by third parties commissioned to execute them:

   - clear, timely and plausible documentation of all assessment processes and results including information on the assessment methods and criteria used as well as their factual and statutory bases;
   - information on how the suggestions and comments of third parties are taken up and processed;
   - information regarding possibilities to participate and raise objections;
   - opening of a communication channel for feedback and comments;
   - setting up of a "clearing house" for public risk debates on the Internet where interested users can access the latest information on risk regulation (including preventive measures) and also ask their questions.
   - information on public events or dialogues on the risk in question;
   - information on literature and other expert opinions.

c) The appropriate participation of social players in the decision-making process is imperative on technical and democratic grounds since the definition of the protection goal, the laying down of conventions when assessing, selecting and weighing up risk-reducing measures are determined by social and political objectives. This should be done with varying degrees of intensity within the sequence of preliminary analyses down to the monitoring of measures:

   - In the preliminary and risk assessment phase, knowledgeable specialists from various disciplines and institutions must be invited to participate in risk characterisation. Methods like the establishment of scientific consensus (for instance expert workshops, Delphi surveys or consensus conferences) are suitable for this purpose. Moreover, there must be an intensive dialogue with the general public about observations and appraisals in the early risk detection.
   - The results of risk assessment should be discussed with stakeholder representatives in direct forms of participation if their interests and concerns are affected to a significant degree by the assessment results. In this case hearings, round tables, advisory committees or scientific consensus conferences are suitable methods. Furthermore, the communication requirements at the interface between assessment and management must be precisely defined. What's more, the procedures for two-way coordination between risk analysts and risk managers, including all the relevant groups, must be specified.

- In risk management all the participants including the stakeholder representatives must be included in the weighing up process. This can be done by means of objection procedures and hearings, but also through new forms of communication like round tables, mediation (in the case of conflicts) or expert advisory committees. One focus here is also the continuation of ongoing monitoring of management measures with the participation of external observers and evaluators. This takes us full circle to early risk detection.
- In the case of particularly controversial issues, which may result in a high degree of social mobilization, the people affected by the risk should be included in the implementation of risk-reducing measures. Here, priority should be given to traditional methods like hearings and citizens' assemblies as well as to innovative methods like citizens' fora, citizens' committees and planning cells.

Organisational recommendations

d) Risk communication needs to be formally incorporated into the organisational structure of the institutions involved in risk assessment or regulation. This includes firmly anchoring risk communication in risk assessment and risk management institutions and the recruitment of risk communication experts onto the teams of risk analysts and risk managers. Moreover, the participating scientific risk analysts and risk managers must be equipped with the communication skills to exchange their approaches and results among themselves and with the other participating players and then to explain them to the general public in an understandable and plausible way. It is, therefore, recommended that initial and continuing training courses and exercises be regularly staged for players from industry, insurance companies and regulatory bodies.

e) A service facility should be set up for all institutions and public agencies for the organisational execution of the communication and participation guidelines. This service facility can either be attached to a federal agency or run as an outside agency. The tasks of this service facility would include:

- providing extensive advice to risk assessment and risk management institutions regarding their communication and participation tasks;
- further developing and updating the manuals on participation and risk communication;
- staging training programmes to improve the communication skills of the experts in these risk regulation institutions;
- setting up and maintaining its own Internet website with general information and communication offers;
- organizing a new or supervising existing "hotlines" for concerned citizens on all questions of risk regulation;
- communicating with the media via regular press releases on risk assessment issues;
- commissioning external research on the subject of "risk communication" and its evaluation for communication practice in the senior federal agencies.

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13 Glossary

This glossary endeavours to explain the terms used in this report and to avoid any misunderstandings relating to specific terms. In some cases, options are also given to facilitate understanding of other interpretations of risk communication terms. Within the framework of the meetings of the ad hoc working group, supplementary and amending formulations were largely taken into account. However, some unbridgeable differences in interpretation did arise with a few members.

Estimation reliability
The degree of reliability when determining the probable occurrence and scale of damage. The precondition is that this can be determined, i.e. that there is neither a situation of ignorance or uncertainty. If the estimation reliability can be quantified using statistical methods (e.g. confidence interval), then the term statistical uncertainty is used.

Agent
Triggers the effect.

Ignorance
No knowledge about the possible consequences of the damage or about the probable occurrence.

Acceptability
Normative judgement on the acceptability of a risk, i.e. a statement on whether and, if so, under what conditions a risk is deemed acceptable for oneself or society. This statement is always based on subjective assessments even when formal decisionmaking procedures are used. Here it is not just the link between scale of damage and probable occurrence but also or more particularly the individual, social and politico-cultural framework which determines the acceptability of risks.

Acceptance
The empirically determinable personal or collective willingness to accept the subjectively ascertained risk of a situation or action.

Discourse
Fora for understanding-based communication in which the validity of arguments is examined on the basis of set rules without regard for the standing or status of the person presenting them for the purposes of acquiring additional knowledge or taking a decision.

Dose-response curve
The functional relationship between quantitatively measured presence/concentration/ amount of an agent and its effect in the target organism.

Impact
Consequence of the effect of an agent. Qualitative or quantitative effect.

Probable occurrence
Probable occurrence is the term used to describe the likelihood that an incident will occur.

Exposure
Exposure of an object of protection to an agent.

Danger
Process, situation or condition that can lead with sufficient likelihood to major harm for man, the environment or other objects of protection. Potentially dangerous properties of a sub-

stance. [BfR]: Product of the probable occurrence and level of damage. In lay language the term “danger” is used when a subjectively perceived threshold is crossed.

Hazard
Presence of a danger for a determinable object like a person, nature, commodity or function.

Hazard potential
Inherent ability of a procedure, condition, situation or agent to be able to cause harm.

Health
Condition which enables people to share and take part physically and mentally without any constraints in the private, professional and social life of society (social wellbeing). Health is not just the absence of sickness. The precondition for remaining in good health is a personal contribution; there is no right to health but to health protection.

Certainty
Condition of unequivocal knowledge about the occurrence of an event, e.g. cyclic events (sun set, tides, start of spring).

Emission limit, limit value
Laying down of quantitatively measurable concentrations/amounts which may not be exceeded or undercut.

Confidence interval
Yardstick for statistical uncertainty. This can only be determined when the estimation reliability can be quantified using statistical methods.

Crisis
A crisis is a loss or weakening of control over steering processes which can seriously and sustainably damage the work of an organisation.

Meta plan technique
Method to support moderation in the collection, visualisation and structuring of contributions by participants. The thoughts and contributions of the participants are noted on index cards and pinned on a board by the moderator. For each question the cards can be assigned to the relevant generic terms (e.g. topic relevance, importance, urgency…) and discussions structured accordingly.

Pollutant
Substance or medium with adverse properties or effects.

Benefit, utility
Positive consequence of an action, event or chain of events. In economics the term benefit is used to describe the subjective assessment of expected consequences irrespective of whether they are positive or negative. In English, by contrast, a distinction is made between utility (state) und benefit (impact).

Open space conference
The basic idea behind the open space conference developed in the USA in 1986 is to process a highly complex topic with the largest possible number of stakeholders. Up to several hundred participants come together to address a specified framework topic. In self-determined workshops they elaborate orientations, ideas and proposals for changes. There is neither an agenda nor a list of speakers. Nor is it clear what the outcome will be.

Risk
Qualitative and/or quantitative characterisation of harm regarding the possibility of it happening and the impact of the harm.

Risk assessment
Scientific process consisting of
a) Hazard identification,
b) Hazard characterisation (= quantitative hazard assessment using e.g. dose-response curves),
c) Exposure assessment and
d) quantitative characterisation of a risk, including an assessment from the natural science angle resulting in recommendations for management options, where appropriate a standard proposal.
In some contexts

Risk evaluation
Process of rational judgement of the acceptability of a risk in which the conclusions from the risk assessment are examined for their acceptability for society or certain groups or individuals. Risk evaluation is the basis for decisions on the need for action. Thus it acts as an interface between risk assessment and risk management.

Risk characterisation
Qualitative and possibly quantitative depiction of a risk.

Risk communication
Interactive process involving the exchange of information and opinions on risks between scientific experts, risk managers (public agencies), representatives of interest groups, consumers (stakeholders) and the interested public at large as a cross-sectional function of risk regulation.

Risk management
Process of identifying and choosing measures for the reduction, control and regulation of risk. This includes politically established limit values, economic incentives, liability provisions, planning techniques and educational or behaviour-changing measures.

Risk regulation
The overall process consisting of risk assessment and management as well as the cross-sectional functions of risk communication [WHO 1995]. In EU Regulation 178/2002 this process is called “Risk Analysis”.

Risk perception
Process of the subjective intake, processing and assessment of risk-related information which stems from one’s own experience, direct observation, reception of mediated messages (for instance through media) and direct communication with individuals.

Harm, detriment, adverse effect
Adverse effects of an action, incident or an agent. This includes losses of financial resources (pecuniary damage), chances of survival (e.g. flight from a natural disaster) and quality of life (e.g. destruction of nature). This category also includes forms of non-material damage like, for instance, loss of faith in the integrity of political decision-makers. In order to be able to identify damage as such, there must always be a person making the assessment. The term harm is, therefore, based on an anthropocentric interpretation.

Harm potential
Sum of possible harm that may arise from an action or incident.

Protection
Result of a reduction in the danger and/or the warding off of damage to an object.

Protection goal
Desired threshold value with a criterion of acceptability which must be undercut or exceeded for a risk to be deemed acceptable. Limit value.

Threshold
Value below or above which a defined effect is not observed whereby an effect identifiable as a leap may occur in the dose-response curve.

Safety
Safety describes a condition in which the residual risk is classified as acceptable.

Statistical uncertainty
The term statistical uncertainty is used when the estimation reliability of the occurrence of an event can be reliably quantified using statistical criteria (e.g. 95% confidence interval). If sufficient data from past observations are available within an acceptable range and future analogous environmental conditions can be taken as the basis, statistical uncertainty can be determined using classical statistical methods.

Incident
Sudden unexpected event that interrupts the routine course of an action and can lead to a danger. Accident.

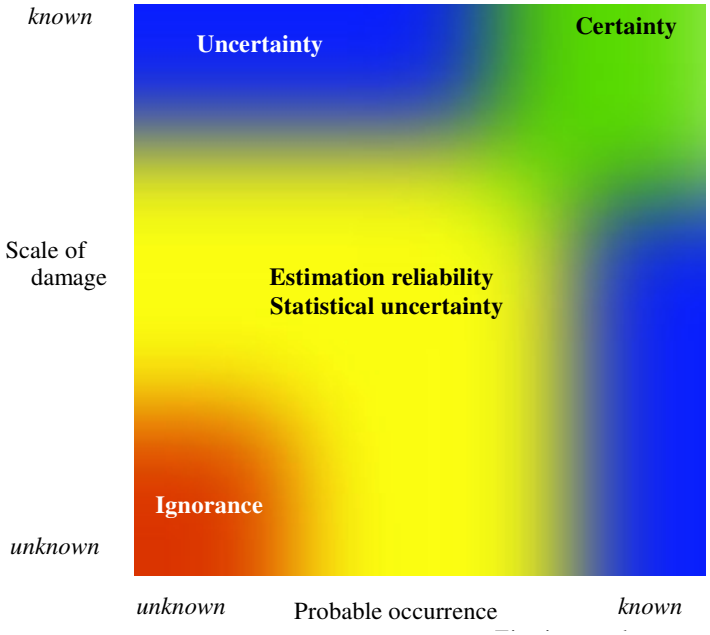
Indeterminacy
State of uncertainty where the scale of damage is largely known but no reliable statements can be made about the likelihood of it happening.

Accident
Sudden event caused by damage. Incident.

Uncertainty
The fundamental inability of a risk assessment to undertake the deterministic forecast of harmful events. Uncertainty can be differentiated into ignorance, vagueness and statistical uncertainty. Uncertainty is the generic term for ignorance and indeterminacy. Uncertainty is the fundamental property of risk whereas estimation reliability can vary between extremely high and extremely low.

Trust
Trust within the framework of risk communication means “being able to rely” on the existence of competence (knowledge, skills), upholding of fairness (openness, equal opportunities) and the assumption of social responsibility (e.g. vis a vis staff, customers, neighbours and the general public).

Preliminary analysis
Phase of identifying the problem which encompasses the elements: determining the protection goal, early detection of risks, decision on urgent need for action and setting of priorities as well as the setting out of framework conditions for risk regulation or a decision on deviations from (e.g. shortening of) normal procedure.



Precautionary principle
Action maxim according to which the lack of scientific certainty cannot be used as justification for not taking appropriate, economically acceptable measures. This means that every sensible step is taken to avoid unnecessary or future risks [WHO 2000]. In contrast to hazard prevention which seeks to avoid the occurrence of “damage deemed to be sufficiently likely”, the precautionary principle already addresses “theoretically possible” or “suspected” damage.

Value tree analysis
The goal of the value tree analysis is to present the latent values of a person or group in a logically consistent and plausible form of communication To this end, individual or group value trees are elaborated initially with the help of interviews. All the decision-relevant values of all the groups are incorporated into a systematically and logically structured hierarchical tree structure (individual value trees). Then all individual value trees are merged into one overall value tree and validated by the person or group after joint examination and semantic clarification of all the values. The result is a fair, complete and problem-driven assessment basis which contains intersubjective justification for the normative assumptions taken over in the value tree and also gives a transparent depiction of the values for outsiders.

Effect
Physiologically measurable change to an organism, environment or object caused by an agent.

Two-way communication
By way of extension to the one-way communication between sender and receiver, two-way communication is the term used for a variety of feedback opportunities for the addressees of risk communication. The spectrum ranges from the granting of opportunities to present the perspectives of the addressees down to the active participation of the stakeholders in the decision-making process.

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