Edited by Ellen Ulbig, Rolf F. Hertel, Gaby-Fleur Böl

Communication of Risk and Hazard from the Angle of Different Stakeholders

Final Report

Authors:
Dirk Scheer
(Institute for Ecological Economy Research (IÖW), since 11/2008: Interdisciplinary Research Unit on Risk Governance and Sustainable Technology Development, Stuttgart University)

Stefan Gold
(Institute for Ecological Economy Research (IÖW), since 1/2008: Discipline International Management, Kassel University)

Christina Benighaus, Ludger Benighaus, Julia Ortleb
(Dialogik, Stuttgart)

Ortwin Renn
(Dialogik, Stuttgart; ZIRN, Stuttgart University Stuttgart)

Imprint

BfR Wissenschaft

Edited by Ellen Ulbig, Rolf F. Hertel, Gaby-Fleur Böl

Communication of Risk and Hazard from the Angle of Different Stakeholders

Federal Institute for Risk Assessment
Press Office
Thielallee 88-92
14195 Berlin

Berlin 2010 (BfR-Wissenschaft 11/2010)
149 pages, 14 figures, 26 tables
€ 10

Translated by: Aileen Sharpe
Printing: Cover, contents and binding
BfR printing house Dahlem

ISSN 1614-3795 ISBN 3-938163-67-4

Table of Contents

Preface

The Federal Institute for Risk Assessment has the statutory remit of engaging in active and participatory risk communication. One of its tasks involves clarifying the understanding and actual use of the terms “risk” and “hazard” which are of key importance for risk communication on the basis of risk assessment results. Prior experience with risk communication has shown that the terms are used in different ways because of the varying perspectives of public authorities, NGOs, associations and industry. This can lead to misunderstandings when it comes to risk communication. The Federal Institute for Risk Assessment launched and supported a project that looked at the causes behind the different uses and interpretations of the terms “risk” and “hazard” by the stakeholders involved in the risk communication process. The Institut für ökologische Wirtschaftsforschung (Institute for Ecological Economy Research - IÖW) gGmbH and Dialogik gGmbH were commissioned to carry out the project.

This report is mainly based on the final report of the “Communication of Risk and Hazard” project which was conducted between July 2006 and June 2007.

The focus of the project was:

- to examine the understanding and use of the terms “risk” and “hazard” in risk communication with the involvement of the stakeholders in public authorities, NGOs, industry and associations,
- and to develop action recommendations and options for possible organisational measures to optimise risk communication.

The study results reveal the diverse nature of the understanding and use of the two terms. Based on the literature analysis and empirical studies like expert interviews and focus groups, the causes are to be found in the different understanding of the terms by the scientific disciplines and stakeholders. The later are broken down into six types: media, public, regulatory authorities, associations/non-governmental institutions, industry and science. Other causes are the world views and the risk concepts of the stakeholders, which, according to the study results, have a major impact on their risk perception. Consequently, different interests are represented and also communicated in risk assessment. As the gaps in knowledge grow, so does the likelihood of fundamental comprehension and communication problems. In this context the communication of hazards is in general more prone to comprehension problems between the stakeholders involved than the communication of concrete risks as, in their case, a higher level of knowledge must be available *per definitionem.* Last but not least the different protection goals of the various disciplines - depending on the type of risk and situation - call for strategies to protect human health that are oriented towards the hazard or the risk.

From these empirical results action recommendations are developed for four theme areas of risk communication deemed to be particularly relevant and measures are proposed. One theme area is consideration of the different risk concepts. What are proposed are, amongst other things, forms of stakeholder participation in the risk assessment process. Another theme area concerns the development or extension of communication skills of the stakeholders involved in the risk communication process. The proposed measures encompass, for instance, communication training courses and sessions and mutual coaching for public authorities and stakeholders. Furthermore, a third theme area is recommended that involves orienting the content and form of risk communication towards the target groups. To this end, for instance the establishment of target group specific two-way communication and new paths for communicating with the population are proposed. The fourth theme area refers to the field of “transparency and coordination” in risk communication that should also include coordinated and target-group oriented communication by public authorities. Concrete recommendations are made which concern both individual measures within public authorities as

well as measures to optimise the exchange of information with stakeholders and the public at large.

Some of the measures proposed in the action recommendations will not be implemented for quite some time whilst others are already part of daily practice. They certainly provide an occasion to discuss the proposed measures and, if possible, to try them out in practice.

This report is intended for all interested circles that are involved in the risk communication process. With this project BfR wishes to contribute to a better understanding of the problem of terms amongst the stakeholders and to a further optimisation of risk communication.

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

1 Introduction

The Institut für ökologische Wirtschaftsforschung (IÖW) gGmbH and Dialogik gGmbH were commissioned by the Federal Institute for Risk Assessment (BfR) to carry out a study on possible communication problems in the use and handling of the terms “risk” and “hazard” in the field of risk communication. The goal of the project was to examine the understanding and use of the terms “risk” and “hazard” in risk communication from the angle of public authorities, NGOs, associations and industry and, on that basis, to elaborate action recommendations and options for future activities by BfR with a view to involving external stakeholders like associations, NGOs, industry or other public authorities more effectively in the BfR communication process. The project ran for 12 months – from July 2006 to June 2007. This final report documents the research project.

1.1 Overview of the Project

Project background
Risk communication involves the interactive exchange of communication (assessments, estimations, opinions) on hazards and risks between various stakeholders involved in the communication process. Misunderstandings and communication problems occur again and again between the stakeholders that can be traced back to different causes for instance:

- Instrumentalisation of the communication process for their own purposes (e.g. highlighting the opportunities of technologies or scaremongering),
- Various emotional and cognitive processing styles (e.g. emotional reactions),
- Different social positions (experts/laypersons) or also
- Knowledge deficits, risk traps and different interpretations.

The hypothesis of this study is that one communication problem stems from the unclear definition of terms and the use of the two central terms “risk” and “hazard”. No uniform definition of these terms can be found in the literature[1]. Even the stakeholders who communicate the risks use these terms in different ways or as synonyms. This means that misunderstandings in information and communication are pre-programmed. The following questions were therefore the focus of research within the project:

- Is there a different understanding and different use of the terms by the stakeholders?
- What is the reason for the different use of these terms?
- What causes can be identified for the different approaches?
- How and what can public authority risk communication contribute to successful communication?

Working definition of the terms “risk” and “hazard” in the project
As the basis for their work the project team selected definitions of the terms that are customary within BfR (BfR 2005):

The term “hazard” describes the inherent potential of a substance (chemical) in toxicology to cause an adverse effect in the target organism. Dose-response relationships are the basis for this. The term “risk” is the product of the scale and probable occurrence of damage. Exposure data are the basis for probable occurrence.

[1] Cf. the definitions of hazard and risk in Chapter 3.1.1.

Goal

The goal of the project initially focused on examining possible communication problems when using and handling the terms “risk” and “hazard” in the field of risk communication. Action recommendations were then to be developed for possible organisational measures by public authorities. The main target groups are non-governmental organisations (NGOs) and (professional) associations. The project team pursued the following concrete research goals:

Research goal 1: Reconstruction of the understanding and practical use of the terms “risk “ and “hazard” in risk communication from the angle of public authorities, NGOs, associations and industry.

Within the framework of the first research goal the understanding, handling and use of the terms “risk” and “hazard” are to be examined in risk communication particularly amongst NGOs, associations, public authorities and industry. If one takes a closer look at the public discussion then it would seem that many stakeholders from environmental protection groups and NGOs mainly base their communication on aspects of hazards for the environment and health. Industry and many public authorities, by contrast, direct their communication more towards exposure and the probable occurrence of hazards. They tend to focus more on the risk concept.

Research goal 2: Development of action recommendations and options for possible organisational measures by public authorities

In a second step after evaluation of an empirical survey (interviews and focus groups), action recommendations and options are to be established for future actions by public institutions, in particular the Federal Institute for Risk Assessment (BfR). The goal is to involve external stakeholders in an effective and efficient manner in the communication process on risks and to encourage them to participate in a suitable manner.

Project concept

The project distinguishes between a total of five project phases spread over the project term of 12 months (cf. Table 1):

Table 1: Project phases and timeline

Project phases	Project months (July 2006 to June 2007)											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Detailed project concept	↻											
2. Literature search and analysis												
3. Recording of empirical data					🕮	.						
4. Evaluation phase (empiricism)					↻							
5. Synthesis phase										🔊		🕮

Coordination talks: ↻ *Final colloquium:* 🔊 *Report:* 🕮

The focus of the project was on recording empirical data in the third project phase in which 53 experts from politics, industry and civil society were involved.

Furthermore, the project team conducted 26 questionnaire-based expert interviews. Using a standardised questionnaire, experts mainly from business and social associations, NGOs and public authorities were asked about their understanding and use of the terms “risk” and “hazard”. IÖW gGmbH was responsible for carrying out the expert interviews.

Furthermore, three focus groups were staged with representatives from industry, associations, NGOs and public authorities in order to simulate the dynamic of the course of an argument and to obtain a group-based estimation of “risk” and “hazard”. A total of 27 people took part in the focus groups. Dialogik gGmbH was responsible for staging the focus groups.

1.2 Structure of the report

This final report presents the research project and sums up the results. This encompasses a project concept, the project course, the research results and their interpretation.

The report initially outlines the subject of the research in Chapter 1 on the basis of two research questions. Chapter 2 describes the project concept. It details the concept and procedure for carrying out the literature analysis and empirical data collection. Chapter 3 presents the results of the literature analysis. It contains the results of the literature evaluation on the relevant themes like the terms “hazard” and “risk”, stakeholders and risk communication, efforts to explain risk perception and social communication as well as problem areas and implementation measures in risk communication. Chapter 4 presents the empirical results from the expert interviews and focus groups. Chapter 5 encompasses the action recommendations in four theme areas with concrete proposals as well as an excursus about the participation procedure in risk assessment. The report ends with a short summary in Chapter 6.

2 Method

2.1 Project course: Steps

Steps in the project (project plan)

A distinction can be made between the following steps based on the project phases listed in Table 2:

Table 2: Overview of the procedural steps in the project phase by phase

1. Detailed project concept
• Concretisation of the goal and structure of the project
• Quality assurance: Involvement of experts, listing of criteria
• Evaluation concept (empiricism)
2. Literature search and analysis
• Laying down of criteria for selection of literature
• Literature search and selection based on the criteria
• Literature analysis of the individual questions
• Compilation of the most important results and open research questions
3. Recording empirical data
• Laying down of criteria for the selection of interview partners and participants in the focus groups
• Questionnaire design (concept, questionnaire development)
• Selection and contacting of interview partners
• Staging and documentation of the individual interviews
• Focus group design (concept, question catalogue)
• Selection and invitation of participants to the focus groups
• Staging and documentation of the focus groups
• Preparation of the interim report
4. Evaluation phase (empiricism)
• Coordination talks at BfR in Berlin
• Evaluation of the individual interviews
• Evaluation of the focus groups
• Synthesis of results, statements and open questions
5. Synthesis phase
• Final colloquium: staging and evaluation
• Compilation of the results (final report)

1. Detailed project concept

In project phase one the project plan from the application was concretised and the procedure precisely defined (cf. Table 2). The methods for the interviews, the design of the questionnaire (interview) and catalogue (focus groups) and the ensuing evaluation of the data were aligned with the project goals. In order to guarantee a targeted and plausible procedure, the project team laid down the selection criteria for the literature search and the selection of interviewees.

2. Literature search and analysis

The focus of the processing of the theme was on the definition of the use of the terms “hazard” and “risk” as well as indirectly the question of risk communication with stakeholders, i.e. between public authorities and external stakeholders like NGOs and associations. Within the framework of a comprehensive literature search and analysis, around 400 literature sources were examined for their relevance for the research topic. What was noticeable was that very little literature could be found specifically on the differences between the terms and that the literature sources mainly describe the use of risks or hazards. Around 100 different literature sources were examined in more detail.

The criteria for the literature selection were first and foremost:
- deals with the topics “risk” or “hazard” or the German terms “Risiko”, “Gefährdung” or “Gefährdungspotential”;
- defines the terms “risk” or “hazard”;
- contains conceptual reflections on the theme risk communication;
- describes communication models of risk communication;
- gives good/bad examples of risk communication by public authorities, NGOs or industry;
- presents measures and (sociological-communicative) models;
- analyses risk communication and participation methods;
- presents application areas (food, chemicals, radiation).

The next criteria of importance for the literature selection were:
- they take into account association research (How are the organisations structured? How do they communicate? What does the consumer expect?)
- they mention areas of conflict in risk communication.

The goal of this content processing was to develop an application-oriented communication concept, which breaks down (risk) communication between all the stakeholders into individual communication steps, content and instruments, renders the different communication behaviour transparent and gives reasons for it. The various application contexts of “risk” and “hazard” were analysed in English, German and international usage and referred to various application levels including: chemicals, food, drinking water, radiation, etc.

3. Recording empirical data

Preparation of the interviews
The focus of the empirical study in the project was on individual interviews with external stakeholders like NGOs, associations, public authorities and industry concerning the use and handling of the terms “risk” and “hazard”. Their use and meaning contexts were to be examined from different angles in order to identify differences in understanding or misunderstandings in the various phases in the communication process. The preparatory phase of the interviews consisted of the following working steps: selection of the participants, questionnaire design and preparation of the questionnaire/question catalogue.

Selection of the participants
The representatives of public authorities, NGOs, industry and associations contacted in the interviews all come from Germany. Contacts were made with cross-theme and cross-sector NGOs and associations as well as with theme-specific stakeholders.

What was important for the quality assurance of the project was the suitable composition of the interview partners and focus groups. To this end, the project team drew up selection criteria for filtering out the stakeholders from the areas industry, associations, NGOs and public authorities. The team agreed the criteria and lists of proposed names with BfR.

The criteria were:
- Institutions which communicate hazards or risks,
- Institutions which focus in their work on food (from the production of risky products down to communication about hazards and risks),
- Institutions from the areas of chemicals and radiation,
- Federal and *Land* levels in the case of the representatives of public authorities, associations and NGOs; large companies with their own "risk communication" departments in the case of industry representatives,
- Interest of interview partners and participants in the theme.

When putting together the focus groups, efforts were also made to achieve a good "mix" to ensure that there was equal representation of the federal and *Land* levels and that the various areas food, chemicals and radiation were covered.

Survey design
The data were recorded with the help of a standardised questionnaire and question catalogue. This primary data collection was necessary because no secondary or tertiary data were available from previous survey rounds that could have provided information on communication problems when using the terms "risk" and "hazard".

The project team selected as the methodological approach the **questionnaire-based expert interview** (on the telephone and on site) in order to talk to representatives of science, politics, industry and society. With this method it is possible to examine diverse situations on the basis of expert knowledge. As a recording procedure, the expert interview generally aims to identify "the knowledge of experts about the situation which is of relevance for the research scientists in the context of the questions on the subject matter in hand" (Deeke 1995: 11). Based on this, expert knowledge can be defined as follows: "expert knowledge is knowledge which a person has on (a) a specific situation or (b) as a participant in a specific process or event" (Kranwischer o.J.: 95). Furthermore, there is the advantage that complex and comprehensive questionnaires can be used and in a more in-depth interview there is also a chance to "ask additional questions".

Besides the individual interviews **focus groups** were conducted with the same target groups in order to test the strength and persuasiveness of the arguments and estimations in a dialogue with other people, and to examine the solidity of individual positions within the framework of the exchange of arguments (cf. Krüger 2000, Witte 1998, Lamnek 1998, Henseling *et al*. 2006). The focus group method involves a clearly structured and professionally chaired group discussion in a small circle (maximum 12 individuals) on a previously stipulated theme. The combination of individual interviews and focus groups guarantees that an empirical snapshot is combined with the simulation of a dynamic argument.

Design of the questionnaire/question catalogue
The goals of the project and the first results of the literature analysis served as the guidelines for the design of the questionnaire for the individual interviews and the question catalogue for

the staging of the focus groups. The theme blocks for the interviews and the focus groups were aligned in order to ensure comparability of data. In close cooperation with BfR the following overarching theme blocks were selected for both empirical approaches:

Theme block I: Introduction – stakeholders in risk communication
Goal: Understanding the importance and concrete activity areas of the respondents in the area of risk communication.

Theme block II: Terms “hazard”/”risk” in risk communication
Goal: Understanding and use of the terms “risk” and “hazard”. Furthermore, other terms that may be responsible for communication problems as well details of the context in which these terms are used.

Theme block III: Importance and practical use of risk communication
Goal: Knowledge about risk communication currently undertaken in Germany and indications of particularly positive/negative practical examples.

Theme block IV: Problems (or challenges) of risk communication
Goal: Detailed findings on perceived problems of risk communication in Germany.

Theme block V: Estimation of risk communication stakeholders
Goal: Expectations of and experiences with the stakeholders involved in risk communication.

4. Evaluation phase (empiricism)

Evaluation of expert interviews and focus groups
The empirical data were systematically evaluated using qualitative and quantitative methods. Full details of the evaluation procedure are given in Chapter 2.2.

5. Synthesis phase

Final colloquium
After the evaluation of the interviews and the focus groups, the project partners presented the results of the project at a one-day colloquium to a selected circle of participants (approximately 100 people). The event was entitled:

“What is a risk? What is a hazard? Different views of stakeholders in risk communication”

and was conducted together with BfR at its Institute on 10 May 2007. The goal was to discuss and evaluate the empirical findings of the analysis but above all to derive action recommendations for the practical implementation of risk communication with the participants. Beside the circle of participants, other representatives of public authorities, NGOs and associations were invited as agreed with the client.

Final report
The final report aims to provide an implementation-oriented concept for future action in risk communication between public authorities, NGOs, the general public and industry. To this end, it initially documents the procedure (Preparation and staging of interviews) and presents the processed results. In a second part the measures derived on the basis of the colloquium discussions are explained and formulated as practice-oriented action options. The advantages and disadvantages of the individual options are highlighted. Concrete recommendations were then derived for risk communication between BfR and its stakeholders.

2.2 Method expert interview: Explanations, use, empiricism

Explanation Expert interview and use in the project
Definition expert interview
Expert interviews are a permanent feature in the methodological tools used in empirical social research (Bogener/Menz 2002; Lamnek 1995; Mayering 1990). This method encompasses a broad spectrum of different options and is, therefore, highly adaptable to the respective research interest. For Gläser and Laudel, "Experts are people who have special knowledge about social situations, and expert interviews are a way of tapping into this knowledge" (Gläser / Laudel 2004: 10). As no analyses or data were available from prior surveys on communication problems when it comes to the understanding and use of the terms "risk" and "hazard", which are the basis for this study, a primary data collection was necessary. These data were collected by means of questionnaire-based expert interviews that were conducted with equal numbers of representatives of three groups of stakeholders (public authorities, industry and professional associations, consumer and environmental associations). Roughly one-fifth of the interviews were conducted in person on site, all the others over the phone. A total of 26 people and institutions were interviewed. The results of the survey were documented for internal purposes and anonymised for the evaluation.

Selection of experts
The selection of the experts was mainly oriented towards the specific research interest. In principle, however, each expert had to have at least one of the following two characteristics: the expert should bear responsibility for the concept and the implementation or the control of a problem solution and/or he[2] has "privileged access to information about groups of individuals or decision-making processes" (Meuser *et al*. 1991: 443). Besides these two criteria the project team, depending on the concrete project question, elaborated further criteria which were taken into account when selecting the experts:

- Relevance/importance of the institutional organisation in the "concert of interest groups",
- Theme or subject-specific proximity of both the institutions and their representatives to the risk and hazard themes addressed by BfR and
- Selection of experts by name who work closely with BfR.

Questionnaire concept and development
For the expert interview, a procedure based on a partially standardised guide or questionnaire is recommended in the literature that filters out the topics of interest to the researcher from the broad spectrum of possible topics and, in this way, focuses the interview on what is really relevant for the study goal (Meuser *et al*.: 453). In this project a questionnaire concept was initially developed with the following elements:

- Staging of a survey based on a partially standardised questionnaire with open and closed questions.
- Target group-specific questionnaire with overarching and group-specific parts.
- Structuring of content in five theme blocks. Around 5-6 questions were to be asked in each theme block.
- The questions were to cover the respondent's own understanding, the contexts in which the two terms are used and the action options and wishes derived from them. This was to guarantee firstly that knowledge and experience about current practice were recorded and secondly that requirements, the need for reform and improvement potential were also covered.

[2] In the interests of easier reading, only the masculine form is used in the body of the text.

The expert interview can be staged as a quantitative and/or qualitative procedure – or as a combination of both (Bogner *et al*. 2002: 20; Meuser *et al*. 1991). When developing the questionnaire in this research project, a mixed form between a quantitative and qualitative procedure was selected. A quantitative orientation in the form of closed and scaled types of questions aims primarily to ensure the systematic comparability of results. A qualitative orientation, in contrast, only permits a limited systematic comparison. It aims primarily to identify the subjective linking of knowledge and assessment contents undertaken by the respondent in his own mental representation of the survey subject. In this research project both methods were deemed to be promising and complementary as both a comparative consideration between the stakeholders as well as the recording of the structures of individual expert knowledge on individual questions were deemed to be very beneficial. Against this backdrop the project team decided in favour of a mixed form for the elaboration of the questionnaire.

The expert interviews conducted in this project are based on a largely standardised questionnaire with a mixture of open and closed questions. The standardisation of the question content and the set sequence of questions makes sense above all when experts are targeted as the source of information, data and facts that cannot be acquired in any other way, for instance from a literature analysis (Meuser *et al*.: 448f.). This applies to the research goals of this project. After the introductory questions, the questionnaire covers various aspects of the "risk" and "hazard" concepts that are central to risk communication. Furthermore, it examines the importance, practice, problems and challenges of risk communication. It is rounded off by a self-assessment and external assessment of the stakeholder groups involved. Each of these five theme blocks aims firstly to establish the status quo in risk communication in Germany and secondly to identify the action options that can increase the effectiveness and efficiency of future risk communication (cf. on this subject the five theme blocks in Chapter 2.1/Recording empirical data). The knowledge and experience from current risk communication practice and the positive and negative examples, shortcomings, need for reform and proposals on improvements made by the experts are the foundation for the elaboration of measures and action recommendations on improving risk communication in the rest of the project.

Staging of expert interviews

The success of the expert interview depends very much on the interviewer's competence and experience in conducting an interview. The interviewer should become a "quasi-expert" in the run up by means of a comprehensive induction in the subject in order to be able to conduct a targeted and result-driven interview on a peer level (Pfadenhauer 2002: 125f). Within the framework of this project the project team and interviewers were able to fall back on their comprehensive expertise and many years of experience in the staging of social scientific research projects and this honed their interviewing skills. For the purposes of familiarisation with the subject, the prior literature analysis and the related questionnaire development were an important and decisive component in acquiring expert knowledge in the research area of risk communication.

Evaluation of the expert interviews

Whereas closed questions could be evaluated with the help of statistical methods like longitudinal and scattering measurements based on suitable electronic data processing (Excel, SPSS), the qualitative evaluation of the answers to open questions involved mutual comparison of the individual texts in order to identify the "common, supra-individual" elements (Meuser *et al*.: 453). For the purposes of qualitative analysis various evaluation strategies can be pursued. (e.g. transcription, paraphrasing, sociological conceptualisation).

In this project all expert interviews were documented. This was done for each individual interview using an input mask elaborated for this purpose. It recorded the quantitative and qualitative answers to each question. The documentation was done on the basis of the hand-

written manuscripts prepared by the interviewers during the interview and the interview recordings. The available material was then evaluated from various theme angles. This encompassed for example, stakeholder-specific patterns of response behaviour, the analysis of the understanding and use of the terms “risk” and “hazard”, the compilation of illustrative examples of successful/unsuccessful risk communication or the positioning of the stakeholders in the communication process (cf. Chapter 4.1).

As a rule, the quantitative evaluation was done on the basis of simple frequency distributions. To this end a distinction was made between three groups of stakeholders (politics, industry, civil society, i.e. environmental and consumer associations). Given the small total number of cases (n=26), the quantitative results are not representative in the statistical sense. This applies in particular to the results that are based on a stakeholder-specific differentiation. The goal of this quantitative assessment was not to undertake a representative generalisation of statements about a population but rather to generate plausible **trend statements** in respect of content without any claim to representativeness.

2.3 Method focus groups: explanations, use, empiricism

Explanation focus groups and use in the project
Definition of the focus group method
Characteristically, a focus group is a discussion around a given topic between 6 to 12 participants, which is monitored, guided if necessary and recorded by the researcher (Bloor et al. 2001: 78).

A focus group is a qualitative survey method whereby a group of people representing specific interests are encouraged to provide information on a specific theme in a planned discussion (according to Henseling *et al*. 2006: 10). This method was originally used to assess radio and film programmes by Paul Lazarsfeld and Robert Merton in the 1940s (Morgan 1997). Because of its pragmatic approach this method was then also taken up in market research and product development. After that the users of the focus groups developed several styles (cf. Lamnek 1998). To sum this up, the focus group method can be used in different applications from practice and research. According to Steyaert *et al*. (2006: 127), focus groups are suitable for:

- evaluating the theme-related interests and values of the stakeholders;
- obtaining a snapshot of public opinion when a total overview is not possible because of time or cost restraints;
- collecting contributions from individual persons and stakeholders;
- gathering detailed reactions and contributions from stakeholders;
- collecting information on the needs of stakeholders;
- identifying additional needs for information or changes and
- further developing questions or offerings.

The focus group method is particularly suited for examining use of the terms “risk” and “hazard” in risk communication. In the course of the discussions additional targeted questions were put about practice and about good examples to NGOs, associations, public authorities and industry. They were then discussed in order to derive action recommendations.

Group size and participants
Almost all the literature (like e.g. Witte 2002, Bloor *et al*. 2002, Henseling 2006, Steyaert *et al*. 2006) recommends restricting group size to between 4 and 12 participants. In the case of groups with less than 4 or more than 12 participants, the group interaction that normally steers the dynamics or the shaping of interests and opinions and has a positive impact on the discussion results often fails to take place. Hence the project team was in favour in this project of a group size in the above-mentioned range. 12 people took part in the focus group with NGOs and associations, 8 people in the focus group with public authorities. The focus group, industry, had only four participants on the day of the event because of three cancellations.

Nevertheless, it is important for the participants in the focus group not to know each other as they otherwise tend to form their own subgroups. This was also taken into account when selecting and inviting participants. In the case of the public authority representatives there was a mix from *Land* and federal authorities. In the case of the NGOs, too, the emphasis was placed on a colourful mixture of organisations like consumer advice bureaus, Bund or e.g. WWF and invitations were also extended to representatives on the federal and *Land* levels. In the case of industry representatives, contacts were made specifically with big companies like Basf, Bayer or Siba as they have a large workforce and it is unlikely that the representatives would know each other.

Length and recording
Focus groups constitute a unique discussion round and as a rule last between 2 and 3 hours. The project focus groups were designed to last 2.5 hours and were staged for the areas “public authorities” and “NGOs” in Stuttgart, for “industry” and “trade associations” in Heidelberg.
The results of the focus groups were documented for internal purposes by means of audio recordings and written notes. They were then transcribed and the documented data were anonymised for evaluation purposes.

Questionnaire concept and structure
In the group dynamic structure of the focus groups, five phases are differentiated in the literature (based on Witte 2002: 12), which Dialogic used in this project (see Fig. 1):

Fig. 1: Phases in the focus groups

Phase 1: Welcome and introduction
Introductory round, presentation of the goals, structure, discussion rules and handling the results by the moderators, expense allowance.

Phase 2: Introductory questions
Start of the focus group with an introductory question. Participants were asked to describe good risk communication and then to report on their general experience with this theme.

Phase 3: Transitional questions
Another working question was put to the group on their experiences from their own practice and they were asked to consider the theme in a larger context. The group recognises that there are different opinions and views of this theme.

Phase 4: Main questions
Based on 5 and 6 working questions, the theme was discussed in depth. In this way the necessary information was obtained.

Phase 5: Final round
At the end of the discussion the moderators presented the group results. The participants were asked to briefly sum up their views, to voice their opinion of the interpretation of the group results and to add any missing information.

Question catalogue

The distinguishing feature of a focus group is its structure along a catalogue containing central questions. This method is frequently described as a “focus interview” or a “structured group interview” (Witte 2002: 3, Lamnek 1998: 18). Dialogik developed a central question catalogue which – similar to the main content in the interviews – encompasses the five theme blocks:

- Theme block I: Introduction – stakeholders in risk communication
- Theme block II: Terms “hazard”/”risk” in risk communication
- Theme block III: Importance and practice of risk communication
- Theme block IV: Problems (or challenges) of risk communication
- Theme block V: Estimation of the stakeholders in risk communication

The central question catalogue consisted of an overarching section and central, stakeholder-specific questions for the individual target groups - public authorities, NGOs and industry. The full central question catalogue is attached in Annex I.

Prior to the discussion, the participants in the groups were sent a 1-page, rough programme draft for the purposes of orientation.

Moderation
For the moderation of the focus groups, Dialogik used the "questioning route technique"[3] which laid down the complete central questions for moderation prior to the focus group. This increased the comparability of the focus group discussion. The question catalogue, however, contained further topics/questions, which Dialogik used in individual cases during the discussions in order to guarantee that they were fluid ("topic guide technique").

Pertinence of the focus groups
Focus groups in general offer the advantage that arguments and opinions are developed in a dialogue with other people and their steadfastness can be examined in an exchange of arguments. The participants draw inspiration from each other's comments and the results are more comprehensive, diverse or deeper than in an individual conversation or interview. The group process promotes new or unexpected argument patterns in the group. The focus group offers insight into what the group thinks and feels about certain things and about why certain opinions were formed (Witte 2002: 4). However, the establishment of a consensus and decision-making are not the goals of a focus group (Steyaert *et al*. 2006: 127).

Focus groups work with small group sizes and this is one of the major disadvantages. They are not deemed to be representative for the entire target group as the number of respondents is too small and they are not subjected in the strictest sense to any random selection mechanism. In order to offset this disadvantage, several focus groups are frequently conducted consecutively with different people from the same target group in order to identify the basic patterns of ideas and arguments more clearly. The alternative is to combine this method with other quantitative and qualitative methods (triangulation method) as was done in this study.

Staging and empirical evaluation of the focus groups
Evaluation of field notes
The project team recorded the focus groups and then made individual field notes on the procedure. The assistants (observers) and the co-moderator took notes, which were just as important as the actual technical recording. On this basis then a short summary was prepared by the moderator and his assistants (cf. Chapter 3.2.2). Based on Witte (2002: 35), the following were recorded:

- Changes in the list of questions;
- General mood: familiarity, enthusiasm;
- Characteristics of the participants;
- Descriptive sentences used by the participants in response to key questions;
- Themes which were addressed on the key questions;
- Body language, in particular correlation between commentaries and the observed behaviour of participants;
- Problems in answering the questions and possible corrections.

After the meeting the key questions/topics and the behaviour of the participants were recorded and compared by observers, moderators and co-moderators and then summarised. The next step was to read or listen to the field notes and audio recordings. During a second reading/listening step, the sequences were marked which referred to the questions in the question catalogue.

The next steps in the evaluation involved the definition of the most important terms in the discussion process like "risk" and "hazard" by the authors in coordination with BfR and the testing of their use in the procedure. These and other frequently used words were filtered out

[3] Prior to the discussion the "questioning route technique" lays down the main questions for moderation whereas the "topic guide technique" merely stipulates a list of topics and leaves it to the moderator to formulate them (according to Witte 2002: 12).

(keywords) and classified by topics. Furthermore, it was examined in what context the keywords were used. After this interim evaluation the coordinators undertook an initial summing up of the results. Open questions and hypothesis were also listed and examined later.

Qualitative (descriptive) and quantitative evaluation
There are two different methods for the further evaluation of the focus group results: firstly the material can be evaluated in a qualitative (descriptive) manner; secondly a quantitative evaluation of the results can be undertaken. The available data material was evaluated using a combination of both methods. The project team initially proceeded to a descriptive evaluation on the basis of the following procedural steps (according to Krüger 1998, 2000 und Witte 2002: 37).

Steps in the descriptive evaluation
Step 1: Topic clustering
First of all the raw material was collected and classified by themes like risk, hazard, transparency etc. The themes were established on the base of keywords and questions of the focus group.

Step 2: Descriptive level
Then the comments on the individual themes and questions from the raw material of the focus groups were compiled. They were broken down into statements, comments and opinions. In addition, quotes which serve as examples for the individual themes in the discussion process were selected.

Step 3: Interpretation of the data
This step encompassed the interpretation of the data and presented certain interpretations. The discussion process was examined for changes in opinions. Arguments, which led to these changes in opinions, were recorded. These arguments provided important indicators for the steadfastness and plausibility of the opinions.

In another analysis the responses of the participants were weighted. Comments, based on experience, were rated higher than statements involving vague presumptions. Furthermore, the course of the discussions of a theme/keyword was once again examined for deviations (Witte 2002: 26) in order to record inconsistencies in interpretation and argumentation. For instance, for the question concerning the use of the terms “risk” and “hazard”, the following working questions can help in the evaluation:

- Examination of the inner concordance of the participants: did the participants change their position or opinion on the use of the terms risk hazard in the course of interaction with other participants? What arguments were advanced for this purpose?
- Specification of the answers: which answers by the participants on the use of the terms are based on experience? Which ones are vague, impersonal answers? Answers based on experience are generally weighted higher in the evaluation.
- Look for “big ideas” or deviations in the course of the discussion: are there ideas that contradict the discussion? Did the discussion generate ideas, which merit being stressed?

Transcription and encoding of the focus groups (“quantitative” evaluation)
In addition to the qualitative analysis, the results of the focus groups were encoded. Based on Witte (2002: 36), the keywords in the discussion process were recorded and classified in categories whereby each category contains at least two and a maximum of seven words. In a next step the keywords were attributed to the individual comments. Each comment was encoded for a central theme or general opinion and encompassed at least two keywords. By recording the keywords, the comments of a specific nature could then be counted and vari-

ous combinations and associations identified. Furthermore, it was easier to filter out individual opinions.

2.4 Quality assurance

The project team incorporated “feedback loops” from BfR as an important element of quality control. In the first phase the working tools like questionnaires, invitation letters, programme of the focus groups, lists of participants etc. had already been coordinated with the client, BfR. All wishes for changes were taken into account. For the literature search and selection of participants, criteria were established in the run up, again in coordination with BfR, in order to avoid a non-specific and arbitrary search and selection.

For the external review of the quality of the questionnaires and the central question catalogue of the focus groups, three experts with a high profile in their areas of expertise were selected from “neighbouring” scientific areas like, for instance, chemical research, environmental and social sciences and food research. They were:

- Professor Dr. Arnim von Gleich, Research Centre Sustainability, Bremen University, Chemical research area;
- Professor Dr. Gisela Degen, Institute for Occupational Physiology, Dortmund University;
- Professor Dr. Dietrich Henschler, emeritus, Würzburg University.

The questionnaire for the expert interviews was developed in close coordination with the client. As an additional instrument of quality assurance, the questionnaire was submitted to the three, above-mentioned, external experts for review. They noted that the basic concept along with the content and design of the questionnaire and question catalogue was suitable for achieving the research goals and confirmed the direction adopted in the development of the questionnaire. On a general level the suggestions of the external experts referred to the problematisation of the terms “risk” and “hazard” which are the subject of a major lack of clarity both in terms of semantics as well as in their use in different scientific disciplines. Furthermore, the experts honed a number of questions and content. These valuable tips, comments and proposals for improvements were incorporated into the detailed concept for the questionnaire and question catalogue at various points and used for fine-tuning.

At this point we would like to take the opportunity to express our sincere thanks for the involvement, valuable comments and tips provided by the above-mentioned experts.

3 Results I: Literature Analysis

3.1 Literature evaluation

The first step of the project involved undertaking a literature research and evaluation on the content level. To this end a list of literature was compiled (roughly 400 items) and selected on the basis of specific criteria. This selection criteria were stakeholder focus, applications, risk concept and communication model which meant that around 100 literature mentions were processed and evaluated regarding their relevance for the question (cf. on this Chapter 2.1., section literature search). The evaluation of content is presented below. To this end the relevant findings of risk communication research were compiled; secondly their potential for explanation and pertinence regarding the project question ("communication problems in the use and handling of the terms "risk" and "hazard") were discussed in conjunction with risk communication.

3.1.1 Communication of "risk" and "hazard" by institutions

"While technical models of risk are relatively narrow and quantitatively precise, the public's model of risk includes a broader set of qualitative factors relating to the potential seriousness of mishaps, the nature of exposure, and their beliefs about the level of knowledge and credibility of science, industry and government" (Kraus/Mamfors/Slovic 1992: 221).

Scientific understanding clearly distinguishes between the terms "risk" and "hazard" and between the various related concepts (Schütz *et al*. 2003: 24). In this context "risk" means a combination of the scale and probable occurrence of damage. The decisive factor here is the weighting of the possible scale of damage with the probability of exposure and the related harm. The term "hazard potential" describes, in contrast, the potential of the trigger of the risk to harm life, health or the environment (Jaeger *et al*. 2001; IRGC 2005). Instead of talking about "hazard", the term "hazard potential" is frequently used in German in order to stress the possibility of a hazard (Schütz *et al*. 2003: 24). Henschler (2006) describes the term however as a pleonasm as the term "hazard" already encompasses the element of potential".[4]

The potential of a chemical to harm a target organism like the health of a human being is defined as a "hazard". One example could be the toadstool which contains a fatal poison for human beings. As long as no one eats the toadstool there is no risk, merely a hazard. However, if one knows or can calculate the probability that mushroom gathers will mistake the toadstool for an edible mushroom and then eat it, then from the probability of the ingestion of a toadstool (exposure) one can calculate the risk of the related ingestion of a certain amount of poison and the expected health impact from the ingested amount (dose-response relationship). The term "hazard" only takes into account the trigger of the risk and concentrates on the possible damage potential whereas the risk also encompasses the probability of exposure and its impact. In contrast to the hazard term, communication about risks must, therefore, also take into account the probability of exposure and the dose-response relationship.

[4] Written comment by Professor Dr. Henschler (2006): "According to the Oxford Dictionary hazard is defined as games with complicated chances". The English word "potential" capable of coming into being". Firstly, the ability or possibility of occurrence is touched on as is the scale of an incident."

Distinction between the terms "hazard" and "risk" on the institutional levels

"Risk communication practitioners and researchers and the general public often confuse key distinctions such as that between hazard and risk and risk communication and risk message" (NRC 1989: 321).

In the language adopted by institutions, associations, public authorities and the public at large the terms "risk", "hazard" and "danger" are frequently used to mean the same thing and no clear distinction is made between the terms or their concepts. Some national and international organisations have clearly defined the core terms "hazard" and "risk" for their own working environment and listed them in a glossary.

Table 3 gives an overview of selected definitions used by German and international organisations. The criteria for inclusion in the table were that the institutions work on the international level, are recognised globally and hence larger circle of users have defined and used these terms. For the German-speaking countries the definitions of WBGU (Scientific Advisory Council of the Federal Government Global and Environmental Change) and BfR have been added by way of example for the purposes of comparison.

Table. 3: Overview of the selected definitions for hazard and risk

International usage

Hazard	Risk
1. International Risk Governance Council (IRGC 2005)	
Hazards describe the potential for harm or other consequences of interest.	An uncertain consequence of an event or an activity with respect to something that humans value (definition originally in: Kates *et al.* 1985: 21). Such consequences can be positive or negative, depending on the values that people associate with them.
2. Australia/New Zealand Risk Management Standard (AS/NZS 1999)	
Hazard: A source of potential harm or a situation with a potential to cause loss.	Risk: The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood.
3. World Health Organisation, World Health Report 2002 (WHO 2002)	
Hazard: An inherent property, for example of a chemical, that provides the potential for harm.	Risk: A probability of an adverse (health) outcome, or a factor that raises this probability.
4. Food and Agriculture Organisation (FAO)	
Hazard: A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.	Risk: A function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard(s) in food.
5. UN, Living with Risk Report, United Nations (2004)	
Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation (United Nations 2004: 4).	Risk: The probability of harmful consequences, or expected losses (death, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from the interactions between natural or human-induced hazards and vulnerable conditions (United Nations 2004: 6).
6. National Research Council (NRC1989)	
An act or phenomenon posing potential harm to some person(s) or thing(s); the magnitude of the hazard is the amount of harm that might result, including the seriousness and the number of people exposed.	Adds to the hazard and its magnitude the probability that the potential harm or undesirable consequence will be realized.
7. European Chemical Industry Council (CEFIC 2006)	
Hazard: The hazard associated with a chemical is its intrinsic ability to cause an adverse effect.	Risk: Risk is the chance that a given hazardous effect will occur.

German usage

1. BfR working definitions, also the foundation for this study[5] (BfR)	
The term “hazard” describes the inherent potential of a substance (chemical) in toxicology to cause an adverse effect. Dose-response relationships are the basis for this.	The term “risk” is the product of the scale and probable occurrence of damage. Exposure data are the basis for probable occurrence.
2. Scientific Advisory Council of the Federal Government Global and Environmental Change (WBGU 1999)	
Damage or hazard is the term used for the sum of possible damage that can be caused by an activity or an incident (WBGU 1999: 37).	From a technical risk perspective, risk encompasses the variables probable occurrence of damage and scale of damage. From a socio-scientific perspective the aspects of social and physical risk experience and risk perception are to the fore whereas socio-economic approaches deal with the risks of ensuring survival and covering basic needs (WBGU 1999: 269).

Conclusion for the project
No uniform communication or use of the terms
Table 3 shows that there is no uniform definition of the terms. Each institution has its own definition. However, there are also differences in the definition of the terms caused by their technical demarcation and use like, for instance, in the case of CEFIC which integrates the terms “health”, “chemical” or “pathogen” into the definition. In the case of many foods or drinking water, the “hazard aspect” is frequently mentioned whereas in the case of chemicals or consumer goods the level of exposure is taken into account (WBGU 1999).

The descriptions in Table 3 show that the definitions contain similar keywords and refer to the same situation. Similar terms used in the above listed definitions of the institutions are:

For “hazard”
- Potential, possible damage, potential damage, potential for damage, potentially damaging incident, ability

For “risk”
- Scale, scale of damage, uncertain result, consequences, disadvantageous outcome, severity of the effect, dangerous effect
- Probability, probable occurrence, opportunity

Semantic indeterminacies – diversity of terms in risk communication
The problems of risk communication amongst the various stakeholders result not least from the diverse terms used along with all their semantic indeterminacies both within expert circles and amongst laypersons. It is not by chance that the German expert committee in its deficit analysis on risk communication in Germany mentions the lack of uniform terminology as the key point of its criticism of regulatory practice (Risk Committee 2003: 20). The authors come to the conclusion that the terminology in risk regulation (risk, hazard, precaution, standard) is not used in a uniform manner by expert disciplines and contexts. Furthermore, different terms are used in the same context. The Advisory Council on the Environment (SRU) has analysed in more detail the various key terms like hazard, danger, risk and damage in a special expert report (SRU 1999). It reveals that the terms are used in different ways in various disciplines like economics, sociology, environmental science or toxicology/epidemiology. Nor is there any coherence within the different scientific disciplines. It is easy to understand that semantic indeterminacies in the understanding and use of risk research terms increase when they are taken over from scientific circles by other expert circles (stakeholders from politics, industry and civil society) or beyond that by laypersons.

[5] Provided by BfR in writing within the framework of the study (BfR 2005).

Communication of risks more difficult
Furthermore, the concept of the risk with additional information about probable occurrence and exposure is more difficult to communicate than the idea of “hazard”. The consumer must estimate his own exposure and then the degree of hazard for his own specific situation. The public at large tends to perceive the “hazard” in a rather intuitive manner whereas it either underestimates or completely ignores exposure and dose (Kraus/Malmfors/Slovic 1992). When, in addition to processing pure information, the consumer must also process, estimate and digest the information for his own situation, then pure one-way communication is often not appropriate. This is where other communication models come in which make possible additional questions and feedback from the consumer (cf. Chapter 3.1.4 Communication models).

Importance of the two concepts for risk regulation
In risk assessment and risk management, strategies are pursued which depending on the type of risk and situation are oriented towards the hazard or the risk. In the case of food and drinking water the emphasis is frequently placed only on the danger aspect (one recent example is coumarin in cinnamon) whereas in the case of chemicals in consumer goods the level of exposure is taken into account (WBGU 1999). In this context identifying the hazard is by no means always easy. Frequently, there are also uncertainties which are not easy to interpret never mind communicate. For instance, damage is always understood as being the sum of the negative consequences of human activities or natural events but this can occur in a continuous fashion (like for instance the number of people hurt in car accidents) or in a discrete manner (only when a certain pressure is exceeded does a boiler explode). When determining the hazard therefore a guiding parameter or the good or goal to be protected must be defined (Bechmann 1990; Kolluru/Brooks 1995; Banse 1996; Rosa 1997; IRGC 2005). This could be for instance the intact environment, the inviolability of human life or compliance with stipulated health standards. These aspects of the distinction between risk and hazard must be taken into account in risk communication.

3.1.2 Stakeholders in risk communication with public authorities

In the risk debate the very different understandings, argumentation patterns and communication strategies of different groups of stakeholders play a central role and are responsible for a number of problems that occur in risk communication (cf. Chapter 3.1.5). Discrepancies in risk perception and assessment between the different stakeholders, particularly in the direct comparison of “experts” and “laypersons” are often deemed to be irrational or as efforts to mislead each other ((Schütz/Peters 2002: 40; Slovic 1992; Slovic *et al*. 1995). Each group of stakeholders pursues different goals within the communication process and, by extension, different strategies.

Overall, six types of stakeholders involved in risk communication are frequently mentioned according to Hennen (1990): the group of operators or industry (as the cause of risk) the group of the exposed persons (the people directly affected by the risk), the public at large (all of the interested population and interest groups), regulatory bodies (the bodies responsible for risk regulation like state administration, public authorities), scientists (risk assessment experts) as well as media representatives. For the purpose of characterising stakeholders within the framework of risk communication with public authorities, a deviation from these types is, however, deemed appropriate: a separation between a generally interested public at large and associations and/or non-governmental organisations (NGOs). They pursue a different function and, consequently, different goals in risk communication. This is particularly the case when it comes to the role of the associations and NGOs as they are frequently the first source of information for the public at large.

Description and characterisation of groups of stakeholders in risk communication

Science
The group of *science or experts* is located in the process of risk control above all in the field of knowledge-based risk assessment. Consequently, their role in risk communication is first and foremost the generation and communication of knowledge in order to create a basis for risk management decisions. This group is governed by the maxim of objectivity but must meet the criteria of independence, impartiality and judgement-free values, and create as much transparency as possible in its scientific methodology and generation of knowledge (Renn/Zwick 1997: 105f.).

In literature the risk understanding of experts is described as the product of the scale of damage and probability of occurrence, along the lines of a "technical risk understanding" whereby the operationalisation of these two parameters very much depends on the discipline. For instance, the underlying assumptions differ when it comes to the type of damage to be examined. In the field of health risks this can mean for example: is only fatal or chronic damage taken into account or are reversible or subjective mood disorders considered as well (Schütz/Peters 2002)?

Whereas in the discussion about the risk understanding of experts and laypersons, the statements of the experts are generally used as a criterion for the assessment of the suitability of decisions, very little literature is available that systematically examines the fact that discussion even within a group of scientific experts is often characterised by uncertainty and controversy (ibid: 40).[6] A different handling of uncertainty and a different disciplinary orientation and use of methods can sometimes result in contradictory expert opinions about a risk. There may even by an expert dilemma. In communication this means that both decision-makers, the media and the public at large, refer to those sources which most correspond to their point of view in order to legitimate it (Mohr 1996, Ruddat/Sautter 2005: 75).

The special communication needs of science can be summed up under the aspects of the communicability of technical data, systematic characteristics and different methods.

Regulatory bodies/public authorities:
The *political system* has the function of identifying social needs, discussing them publicly, taking them over into binding provisions and monitoring compliance Renn/Zwick 1997: 101f.). The function of *public authority* risk communication is to generate science-based information for political decision-makers and to promote trust amongst citizens in competent state provisions and precautionary methods. The goal of risk communication or of the overall regulatory process is the legitimation of risk management on a jointly agreed basis by the stakeholders concerned as well as the guaranteeing of individual protection from health risks.

Risk communication is, therefore, a central challenge to the institutional organisation and communication processes of public authorities. When conveying information, what is very much centre stage is above all the management of a large number of different communication partners and communication relationships – public authorities, experts, stakeholders and the public at large (Renn *et al*. 2005).

Public authorities are frequently under pressure to act as a consequence of media coverage and public risk assessment. Often, risks must be communicated for which there is still no (sufficient) scientific assessment or the experts come to different conclusions in their risk assessment. This means for public authority risk communication that public decision-making clout is necessary despite a lack of scientific reliability (Schütz/Peters 2002: 45). This can lead to a loss of trust by associations or the public at large.

[6] Cf. also Chapter 3.5.1 (Risk communication problems).

The special risk communication needs of public authorities or regulatory bodies are, therefore, concentrated on the depiction of the spectrum of defensible risk assessments from science, the determination of reasonable precautionary measures in conjunction with estimating the tolerability of specific risks and compliance with statutory risk regulation provisions.

General public
Hennen (1990) distinguishes between two groups of so-called "lay people": the group of *exposed persons* i.e. the people affected by a risk and the group of the *general public at* large. For both groups it can be said that their assessment of risks is shaped by subjective risk perception which, in turn, is influenced by individual attitudes and values and by the characteristics of the risks assessed (cf. on this Chapter 3.1.3. on risk perception). In the group of exposed people there is also special sensitisation because of subjective concernedness.

From the classical angle, their role in risk communication is that of the receiver. According to Schütz/Peters (2002: 43) they assess information about risk and hazard on the basis of their own plausibility reflections and the estimation of the credibility of the source.

The special communication needs of the general public hence contain first and foremost action instructions for risk reduction, the avoidance of exposure and hazard as well as some indications on how the overall process of risk regulation is to be understood.

Media
In risk communication the *media* serve not only as a source of information and knowledge but also contribute to the formation of opinions and shape the fundamental attitude towards new risk-relevant topics. Hence they provide the "arena" for the public discussion of risks. Besides the popularisation of risk analysis and information, the strengthening of social processes like e.g. conflicts about risks (Kasperson 1992) likewise play a significant role in media coverage. The media's risk understanding is shaped here by the functions of a warning, a wake-up call and the uncovering of erroneous behaviour by the state, industry and associations (Schütz/Peters 2002: 41). Sensationalistic journalism may be another source of attention (Dunwoody 1992): questions of guilt in particular the search for identifiably guilty parties (role of the "scapegoat") and (alleged) attempts at cover ups, conflicts between the parties concerned and a large number of potentially concerned parties are the main triggers for media coverage (Bennet 1999). The emotionalisation of risk topics is the consequence (Schütz/Peters 2002: 44). Studies by Hans Martin Kepplinger (1989) have shown that the scale of media converge of specific risks scarcely correlates at all with the estimation of the size of the risk by experts. This can lead to distorted risk perception amongst the public at large (ibid: 226).

According to Schütz/Peters (2002: 42f.) the presentation of risks in the media is shaped by decision-making contexts within the framework of which risks are considered and less by scientific findings like e.g. probable occurrences. These decision-making contexts are located on three levels according to the authors:

- The level of daily action in conjunction with one's own health, safety and the state of the environment;
- The level of decisions by companies and public authorities about the implementation of new risk sources;
- The level of political-administrative regulation of existing risks.

The special communication needs of the media, therefore, encompass a focus on measures by industry and the regulatory authorities, **the identification** of scapegoats and the focus on potential victims.

Industry
Industry assumes the role of the party responsible for the risk or the operator in the process of risk communication in the case of technical risks and is, therefore, often exposed to controls and criticism by the general public. For that reason the risk communication by companies faces numerous demands: the transparency of corporate decisions vis a vis the public at large, a basic openness in communication regarding the potential risk liability of their products and locations as well as the acceptance of corporate decisions by the population through dialogue. Active risk communication is expected which is frequently hampered by the fact that industry is sometimes perceived as being the "opponent" by the public at large (Meier 1996).

The communication needs of industry are based first and foremost on solid risk assessments by science, possible proposals on risk reductions and questions of liability in the case of acceptable or tolerable risks. In the case of the end suppliers of specific products, the tasks also include proposals for consumer information and crisis management strategies.

Associations/non-governmental organisations
Associations and NGOs are mainly assigned to the group of the interested public at large (Hennen 1990). Consequently, they are understood as being the organised spokespersons of the public at large and consequently as the representatives of their interests. However, it must be stated quite clearly that they have a different role in the communication process as on the one hand they constitute a source of information for the public at large and on the other hand they are dependent - when it comes to carrying out their tasks - on information from science and public authorities. In some cases they have their own expert departments, which in terms of their communication role are basically assigned to the group of science.

Nonetheless, the specific communication requirements of associations and NGOs can be distinguished from those of the general public at large. They are based on the demand for evidence of effective and precaution-oriented management measures from the regulatory public authorities and the demand for as much transparency as possible in public authority risk regulation in order to pass this on to consumers as the associations are often the first point of contact for worried citizens. In this way they assume an intermediate position in the communication process.

3.1.3 Risk perception

The risk perception research, which was shaped by the social sciences and behavioural psychology, has developed into a central area of risk communication research. One of the main findings of this research is that people assess and estimate risks and hazards in a highly differentiated manner. Often those risks, which are seen as threatening and frightening, are less dangerous objectively on the basis of quantitative statistical consideration than is assumed subjectively. What is meant by risk perception? Schütz *et al*. (2000: 1) define this on the basis of the work by Paul Slovic as follows:

"In risk perception research the term 'risk perception' is used to describe attitudes and intuitive judgments about risk (Slovic 1992); in a broader sense, however, risk perception often also includes more general evaluations of and reactions to risk (e.g. regarding the acceptance or mitigation of risk)."

The authors stress the aspects of individual attitudes and the intuitive judgement of risks. Lennart Sjöberg *et al*. (2004: 8) also focus on the subjective estimation of risks and their probable occurrence; however they do stress their collective or constructivist anchoring in social perception and action patterns by noting:

"To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome. (…) perception of risk goes beyond the individual, and it is a social and cultural construct reflecting values, symbols, history, and ideology."

Hence risk perception involves a balancing act between the probabilistic and contextualised dimensions of risk. In general terms, risk perception is, therefore, the empirical research into perception differences in the estimation, assessment and reactions about or in the case of risks and hazards and their carry over to conceptual or theoretical patterns of explanation.

Theories and models – explanatory approaches to risk perception

Various (socio-scientific) theoretical approaches and models are used to explain different risk perception. A distinction can be made between approaches based on the principle of "bounded rationality", the psychometric approach or models of the mental representation of risk. These approaches put the individual estimation and assessment of risks centre stage. In addition, cultural theoretical and sociological approaches in particular endeavour beyond individual estimation to identify cultural, social and organisational contributory factors in risk perception (Wiedemann *et al*. 2006, Renn 1992).

The *principle of "bounded rationality" encompasses the fact according to Herbet Simon 1*957) that human beings only have a simplified model of reality because of their limited information processing capacity and take rational decisions on that basis. In line with their powers of comprehension selectively and objectively framed perception perspectives are noticed. In this way heuristics are established for risk perception about how risks are perceived by the population. For instance the availability heuristic according to which situations are judged without any precise information basis (Tversky/Kahneman: 2005). When applied to the field of risk perception this can mean that the frequency of specific events is considerably overestimated when these events are communicated for instance via the mass media (e.g. BSE cases, victims of natural disasters). But emotional attitudes also play a role in the perception of risks (so-called affect heuristic). For instance Tversky/Kahneman (2005) proved for instance that a positive or negative attitude to a specific risk source influences risk assessment. According to them there is an inverse relationship between benefit and risk, i.e. the greater the estimated benefit, the lower the risk perception and *vice versa.*

In particular the *psychometric approach* has a long tradition in risk perception research. The goal of this approach, according to Jungermann und Slovic (1993: 171), is the "quantitative description of the cognitive and evaluative structure of 'risks' and their determinants". The core of the psychometric model (Rohrmann/Renn: 2000) is an understanding of risk as a subjective concept that is completely distinct from the idea of risk as an objective entity. Here technical and physical as well as social and psychological aspects are included in perception research. The focus of research interest is explicitly on social opinions and attitudes – i.e. lay compared with expert judgements. The empirical research on the analysis of cognitive structures looked for associations of specific characteristics in risk perception and assessment. Empirical trait associations were observed for instance when it came to familiarity with the risk, perceived controllability, potential for catastrophic consequences, direct consequences or also familiarity with the risk in scientific circles and amongst the public at large (e.g. Slovic/Fischhoff/Lichtenstein 1980; 1985; Slovic 1987; Englander *et al*. 1986, Jianjuang 1994). According to Wiedemann und Schütz the psychometric approach had far-reaching consequences particularly for risk communication. They conclude (2006: 8) that the "enlightenment strategy of risk communication (inform and explain) [was] challenged. It was replaced by a dialogue between experts and laypersons and by extension, the inclusion of world view risk concepts in risk assessment and evaluation".

A further approach related to the individual focuses on the so-called *mental* models, i.e. ideas that people have about the emergence and cause-effect relationships of risks (Wiede-

mann/Schütz 2006: 8). In this approach too, the focus is on the contrast between intuitive lay judgements compared with scientific expert judgements. The goal is to identify knowledge gaps in lay judgements. Empirical studies concentrated on the assessment of specific risk sources like, for instance, pharmaceutics (Jungermann *et al*. 1988), chemical household products, nanotechnology (Morgan 2005) or the handling of dangerous substances in conjunction with occupational health and safety (Cox *et al*. 2003). According to Wiedemann und Schütz (2006: 9) mental models are relevant for risk communication when in particular gaps in knowledge and misconceptions are of importance for intuitive risk assessment. However if these are mainly affective and value loaded determinants for risk assessment, then mental models reach their limits.

Sociocultural approaches are demarcated from the above-mentioned approaches to the extent that they stress to a far greater degree the collective and socially mediated factors that impact risk assessment. Their representatives criticised the fact that cognitive and psychological aspects are overstressed in risk perception research. In the words of Weyman und Kelly (1999: 16):
"As such, scientific and technical models of risk are frequently viewed as being unreasonably restrictive and narrow. (...) "Theorists working in this area view cognitive risk research as providing, at best, a partial understanding of risk perception and people's reactions to hazards."

In contrast, sociological analysis placed socio-structural differentiations and social mediation centre stage. In their case the assessment of risks is far less dependent on the genuine attributes of the risk itself than on social interaction and processes. Hence this social impact on education and changes in attitudes to technologies was examined (Short 1989). A number of studies looked at the benefit distribution of risks and the resulting (group-specific) risk assessment (e.g. Kasperson/Kasperson 1983). According to this, the perceived fairness of the risk-benefit distribution between different groups in the population influences risk perception. In this context the socio-mediated acceptance of risks plays a special role. Another important determinant for risk perception in social approaches is the importance of trust in scientific and political institutions and elites as a functional mechanism for reducing complexity (Kaperson/Golding/Tuler 1992; Earle/Cvetkovich 1995). From the angle of Renn sociological studies did contribute to understanding the variability of risk interpretations by various groups in the population but were often restricted to individual cases and did not create any link between scientific risk assessment, the perception of individuals and the social and cultural experience of risk (Renn 2001: 4).

The *cultural-theoretical approaches* attempt to close these gaps by drawing on the cultural prototypes for control of the risk perception process. The risk perception in cultural-theoretical approaches is consequently a function of social and group-specific values and world views. In particular Mary Douglas endeavoured in her work to interpret risks as a social and cultural construct for the integrative function of maintaining social solidarity. According to this each society or group in the population generates its "own risks" and brings them into play. The cultural importance of risk may then also include the function as a "stick to beat authority" (Douglas1990: 4) – i.e. in the supposed instrumentalisation vis a vis decision makers and authorities. According to Renn (2002: 5) cultural-theoretical approaches identified different generic types within society, which construct their own group-specific risks on the basis of specific criteria and world views. A distinction can be made between the following four types: entrepreneurial, egalitarian, beaurocratic or stratified-individualistic – in some cases the "autonomous risk observer" was added as a fifth type.

The criticism levied at cultural-theoretical approaches mainly targets their narrow empirical foundations and the postulated closed nature of the identified types. According to them people are very well able to adopt different overarching social roles. Iain Wilkinson (2001: 11)

sums this up in the following way: “Any attempt to mask the complexity of the social experience of risk perception in rigid conceptual abstractions may lead us further away, rather than towards a more intimate understanding of the day-to-day reality in which people recognise and negotiate with ‘risk’ as ‘hazards’.”

The *sociological system theory* has also taken a comprehensive look at risks – and largely made do without any empirical research. In particular Luhmann has done major work on the concepts (Luhmann 1990; 1991) and puts the distinction between *risk and danger* centre stage of a system-theoretical consideration of risk. Initially he notes that in the “established” areas of risk research the concept of risk is not clearly explained. Based on George Spencer-Brown’s form theory Luhmann undertakes a more precise definition of the term risk by drawing on a differentiation in order to clearly establish when the term risk should be used and in which context it should not. He uses the term “danger” to illustrate this. A fundamental characteristic for differentiating between the terms risk and danger is internal or external attributibility. According to this risk means future damage, which is based on one’s own or system-inherent decisions. In contrast, the term danger is used when the damage is caused externally. Risk, therefore, means the self-attribution of negative consequences of decisions and danger the external attribution (Japp 1996: 66). Japp (ibid) comments “In concrete terms the difference is whether I decide to move close to a nuclear power station or the nuclear power station is built where I already live. This has consequences for instance for the public focus of hazard […]. The *expectation*-oriented handling of uncertainty (risk!) is the decisive interface: not just any “objective” uncertainty not a risky *situation already to be found in the world.* Hence risk and danger both refer to (self or external) *attribution* of the consequences of experience-based decisions, not to a world which unsure in itself which makes all this possible or causes it” (italics in the original by the author*)*.

It becomes clear that the system-theoretical risk research – based on a contingent world in terms of structure – draws on a constructivist risk and danger concept. Hazard and danger are not the expression of an objectifiable situation. This is set against a toxicological understanding of risk or hazard, which focuses very much on the technical measurement of an objectifiable situation.

Risk perception and communication of “risk” and “hazard”
What contribution can research on risk perception make to the study of possible communication problems of “risk” and “hazard” which is the basis of this project?

Initially it can be observed that there are many different and, in some cases, competing approaches to risk perception. This illustrates the fact that risk perception is a highly complex phenomenon, which can be described using clear psychological, sociological and cultural variables. Against this backdrop the existing approaches should be seen as complementary and supplementary even if a – in particular empirical - integrative research design that draws on multi-factorial variables is still a long way off. The different approaches do, however, reveal the fact that there are fundamental differences in the social perception of risks and hazards compared with scientific risk perception based on objectifiable factual knowledge if one assumes, for reasons of simplicity ,uniform scientific risk perception.

People’s risk perception is not (only) dependent on the degree of probability and the scale of exposure but also on psychological, social or cultural variables like voluntariness, trust, acceptance, media presence or benefit distribution. In social perception and interpretation a scientific hazard is a risk with concrete consequences – for instance the intentional sinking of the Brent Spar or the shopper’s boycott of beef during the BSE scandal.

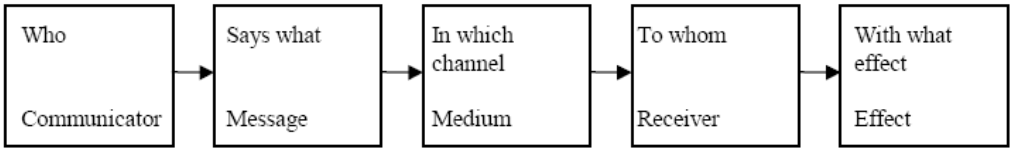
Furthermore, risk perception research focuses very much on the examination of a layperson’s understanding of risks and risk judgements. In most cases a polarisation of the lay perspective vs. the expert perspective was assumed. A comparative consideration of the risk

perspective from the angles of science, industry, politics, media and civil society is the exception. Furthermore, there is scarcely any research on the risk perception of different stakeholders. In this context the findings from risk perception research indicate that different (professional) context, cultural values of the media and own interests are relevant compounding factors when it comes to risk perception and analysis by experts and stakeholders.

3.1.4 Communication models, strategies and methods

The communication sciences distinguish between different communication models and they are relevant when it comes to analysis and shaping the communication processes between institutions. Harold Lasswell (1948) was one of the first to describe the individual elements in the communication process using a simple question formula (Who says what, in which channel to whom and with what effect?).

Fig. 2: Lasswell formula with the elements in the communication process



Source: Lasswell 1948

The simple question was then taken up by Shannon-Weaver (1949) and incorporated into a mathematical model. This linear model was originally designed for the rapid transmission of electrical signals for the Bell Telephone Company. Because of its simplicity and quantitative description of communication between communicator and receiver, the encoding and decoding of messages was quickly taken over into the behavioural and communication sciences and then into risk communication. Shannon-Weaver's model is however very static and only reflects linear communication (Meggle 1997: 3). This leads to misinterpretations; human communication is not linear but dependent on action, reaction, agreement, belief, attitudes and other factors.

Fig. 3: Shannon-Weaver mathematical model

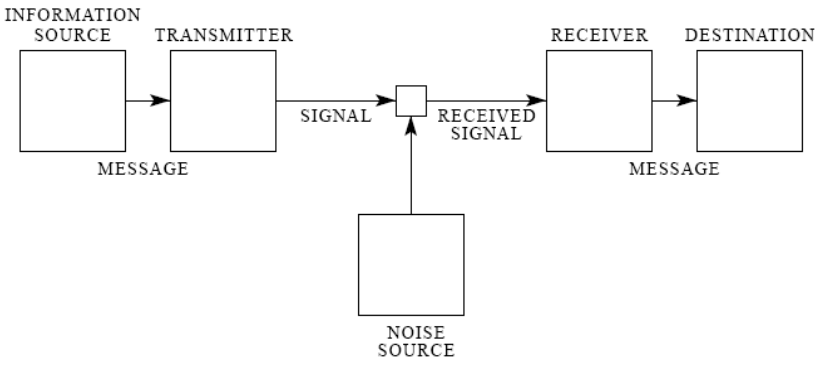
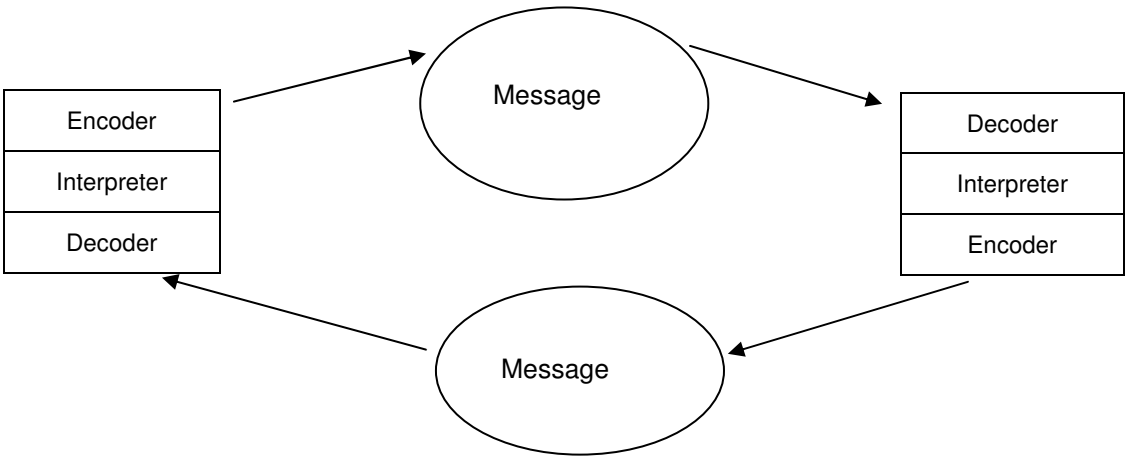


Fig. 1 — Schematic diagram of a general communication system.

Source: Shannon/Weaver 1949

Schramm (1954) added the components feedback from receiver to communicator to this one-way model thereby offering two-way communication. In Schramm's conservation model both partners assume the different roles of communicator and receiver and there is a feedback process (Meggle 1997: 4).

Fig. 4: Schramm's conservation model (1954)



Source: according to Schramm (1954)

For the analysis of the problems of risk communication use is frequently made of the linear-mathematical model of Shannon-Weaver (1949) or also the additional elements of Schramm (Wiedemann *et al*. 2006: 4, see also Covello/Winterfeld/Slovic 1986, Lundgren 1994). Scramm's model only describes the bilateral communication between two parties. Complex multi-layered processes of different sources cannot be explained by this model. In order to analyse and describe human communication Wiedemann *et al*. (2006: 5) propose models for researching changes in attitude like the *heuristic-systematic model* by Chaiken, Liberman und Eagly (1989) or the *elaboration likelihood model* by Petty and Cacioppo (1986) which identify the variables of relevance for risk information. These complex models are not very widespread or have not been used very much up to now in risk communication (Wiedemann *et al*. 2006: 5f.). What are, however, certainly interesting are the systemic approaches by Watzlawick (2000) or Schultz von Thun (1999).

Paul Watzlawick and "human communication"

The sociologist and communication psychologist Paul Watzlawick was interested in the inter-human communicator-receiver relationship. The well-known formulation "*man cannot not communicate"* stems from Paul Watzlawick *(Watzlawick 2000: 53)*. Not speaking also has an information character for him. Communication is circular and has no beginning and no end. Like other communication researchers he also looks at the different levels of communication, the content and relationship aspect (Watzlawick 2000).

Friedemann Schulz von Thun and the "four-ear model"

Schulz von Thun's communication model builds on the classical communicator-receiver approach and postulates that messages between human beings are passed on four different levels and are heard with four different "ears" (Schulz von Thun 1999).

Based on the relatively simple message “smoking is harmful”, the following levels are addressed:

- The *objective ear* only hears the factual information that smoking can harm health.
- With the *self-regulatory ear* the receiver hears the message and concludes, “the communicator thinks that smoking is not good and does not want himself to be harmed through passive smoking.”
- The *relationship ear* endeavours to find out how the communicator feels in concrete terms about the subject matter and the receiver. It could for example say “I am worried about your health.”
- The *appeal ear* hears a demand like for instance “stop smoking immediately”.

Depending on the subject matter and character, people tend to hear with one or at best two of the four “ears”. There is a major risk that the communicator addresses a different level from the one heard by the receiver. For that reason alone there are numerous misunderstandings and conflicts or the risk message has no impact at all.

Communication strategies
If a risk or danger is communicated, then the task and the goal of communication should be clarified beforehand. Karger (1995: 8f.) distinguishes between three areas of communication goals from which different strategies can be derived. This breakdown into goal and strategy can also be readily applied to communication amongst stakeholders, with political circles, industry, public authorities and the public at large.

The following table lists the goals, tasks and strategies based on Karger (1995: 9).

Table 4: Goals, tasks and strategies (according Karger 1995: 9)

Communication goals	Tasks	Strategies to generate
Change attitudes	• Attract attention • Create awareness of problem • Convince • Activate	• Signals • Information • Credibility • Benefits
Influence decisions	• Mobilise	• Confrontation
Solve conflicts	• Balance interests	• Cooperation

Signal strategy
Each high impact subject or each piece of risk information competes with others. Each topic vies for limited attention. The signal strategy aims to overcome the first obstacle in order to attract attention to a risk or danger and then deal with it in a critical manner. Communication ensues via the reaction amongst the public at large which is awakened by symbols or sympathy and empathy (Karger/Wiedemann, 1994; Karger *et. al*. 1995: 11). The signal impact of the topic coumarin is for example currently being transported through the headline “My grandmother used cinnamon when baking, too.”

Information strategy
If there is perception of a risk or danger, this must then be followed by an extensive examination in order to change attitudes after an evaluation and weighing up of risks and interests. The receiver of the information must be above all motivated and capable of accepting and processing messages (Earle/Cvetkovich, 1990; Petty/Cacioppo, 1986; Karger *et al*. 1995).

If the receiver of the information is also affected personally, there is a high likelihood that he will take a close look at the communicated risk or danger. But even when information was formulated in a clear and comprehensible manner the personal risks were known and trans-

parent, the message can still be ignored (Karger 1995: 12). Despite information campaigns spanning several years many people still smoke.

Credibility strategy
In addition to pure information another decisive factor is how credible is the institution that sends out the risk message, amongst the target group (McGuire 1985). According to Karger (1995: 14) the following factors determine the credibility of the institution amongst the public at large

- Tradition
- Consistency between organisation and culture
- Consistency between statements and actions and
- Assessment by third parties.

Benefit strategy
If the receiver is to be encouraged to take precautionary steps, then the benefit strategy is used. In this case the cost-benefit relationship plays an important role. The receiver establishes for himself how much effort is involved and what he will have to change in his behaviour. Besides social norms subjective attitudes are a major contributory factor to behaviour (Aijzen 1991). One message could be "Anyone who plays sport feels fit and leads a healthier life."

Confrontation and cooperation strategy
NGOs, industry and politicians try to promote and influence public discussions by raising topics in the media.

"Conflict lines structure public communication" (Karger 1995: 16).
One well-known example is the consumer boycott of Brent Spar (Medienkritik, 1995). In the case of Brent Spar the NGOs focused on the shortcomings of "big industry". The opposite is a cooperation strategy that seeks to promote cooperation between NGOs, associations, industry and public authorities.

Conclusions of the models and risk communication strategies
Risk communication means the interactive exchange between the general public, NGOs, public authorities and industry. According to the Committee on Risk Perceptions and Communications (1989), risk communication is described

"as *an interactive process of exchange of information and opinions among individuals, groups, and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management" (National Research Council 1989: 21).*

What is important according to the model by Schramm (1954) is that at least two-way communication takes place in which the risk communicator is in direct contact with his target group and that the target group, in turn, has an opportunity to input arguments, ideas, impressions, evaluations of statements (Renn/Kastenholz 2000: 30). Here the main characteristic is the constant swapping of roles between active receiver and communicator as described in the Schramm model (19954). The possible forms of communication are public events, panels, exhibitions as well as written materials or the Internet if the option of information feedback is offered as well.

"Two-way communication is clearly a prerequisite for all forms of successful communication. However, it is often hard to implement and requires flexibility and the willingness to adapt to public concerns on the side of the communicating institution" (Renn/Kastenholz 2000: 30).

Risk stakeholders can use strategies depending on the purpose and type of risk. It is important to carefully analyse the risk in advance and, as for every management step, to set out the goals and the tasks in detail.

3.1.5 Challenges facing risk communication

The problems of risk communication have been discussed particularly in English-speaking areas since the end of the 1980s. A study elaborated by the American Research Council (NRC 1989: 108) makes a fundamental distinction between two problem dimensions: firstly the structural problems of the political-administrative system and secondly the problems between the people involved in the communication process.

First of all the problems which are due to the structure of the political and administrative system – in particular the anchoring in the context of political-legal framework conditions and (fragmented) structures of political decision-making. Statutory provisions on liability issues and information obligations and rights, for instance, have an enormous impact on communication contents and timelines. Whilst communication experts advocate a rapid, comprehensive and transparent information policy for public authorities, legal experts call for cautious and legally backed information for the general public against the backdrop of statutory liability provisions. This has to do with the communication of risk and hazard. When it comes to the identification of a (new) hazard, the probable occurrence and scale of exposure have often not been validated scientifically – the actual facts about a risk are still unclear and this impedes a timely, comprehensive information policy by state bodies in the context of liability questions.

Problems between the parties concerned in the communication process have, in contrast, been covered far more in the literature. It is assumed that this problem dimension is more accessible for concrete solution strategies than the structural dimension (NRC 1989; Guettling/Wiegmann 1996). Wiedemann (1999: 21) distinguishes between generic risk problems and problems of implementation barriers, i.e. risk problems of the communicator. On the factual level generic problems encompass aspects like different views of damage, assessment differences in the sciences, huge uncertainty gaps and various risk messages. On the social level generic problems in risk communication are caused by competition between the stakeholders and the playing up of topics in the media, the reaction of the political system to risk issues and the danger vs. risk perspective. In terms of concrete implementation the main problems are initially organisational and are caused by resource and credibility deficits as well as by understanding and coordination problems. Some aspects of the communication problems amongst the stakeholders are explained in more detail below.

Misinterpretation in communication
The social-scientific (experimental) research on risk communication has highlighted a large number of misinterpretations in communication. As a rule risks are communicated on the basis of risk indicators and parameters. In this context the selection of indicators and parameters is decisive (Purchase/Slovic 1999; Gray 199). Various authors have examined the way in which risks are presented (Stone *et al*. 1994; Magat *et al*. 1987; Halpern *et al*. 1989; Gyrd-Hansen 2003). The relative depiction of a risk seems in this context to lead to higher risk perception; for instance people are willing to pay more for safety when the risk is presented in a relative manner. Furthermore, people have difficulty in converting relative probability data into absolute data. When it comes to verbal and numeric conversions of probability data, reference was made to the communication mode preference paradox (Erev/Cohen 1990). Whereas people wish to have information about probabilities in numerical form they themselves prefer a verbal form in their communication behaviour.

Dealing with uncertainties – a central aspect in hazard communication – is diverse and not uniform amongst the receivers. Johnson/Slovic (1995) have shown that this can lead on the one hand to increased trust in the source of information. On the other hand the providers of the information were also attributed a greater degree of incompetence and distrust. This indicates that social factors like the estimation of trust, competence and own interest of the information source are important in conjunction with uncertainties (Johnson/Slovic 1998). Contextual and more particularly prejudicial factors clearly influence the interpretation of risk messages. Just how exactly uncertainties can be typed was examined by Miles/Frewer (2003). They distinguish, for instance, between measurement errors, expert dissent or uncertainties when it comes to the scale of exposure and probable occurrence.

By way of summary it can be observed that misinterpretation and misunderstandings in risk communication between communicator and receiver can be attributed to a large number of contextual and risk-specific factors.

Different world views – different risk concepts

Risk research has placed the relationship between experts and laypersons centre stage on the stakeholder level and derived different risk concepts from that. Whereas experts assess risks on the basis of objectifiable and quantitative scientific-technical methods, laypersons perceive risks from the angle of contextual and subjective qualitative aspects including, for instance, controllability, voluntariness and the media coverage of risks. At the interface of divergent risk judgements there is a core of understanding and utilisation problems for the terms risk and hazard. What constitutes a hazard in the opinion of experts may already be seen by laypersons as a risk and *vice versa*. Here individual and media risk constructs should not, however, be seen as a distorted image of expert judgements as "they are indeed an opportunity for change and innovation when handling risks (Schütz/Peters 2002: 45).

Whereas research on lay vs. expert judgements is very extensive this is by no means the case when it comes to the differentiated consideration of risks by various experts. The contextual conditions and different world views of experts and intermediate stakeholders have mostly only been researched in risk communication in the US-American context (Clarke 1988; Dietz/Rycroft 1987; Gormely 1987; Jasanoff 1987). The results indicate that the professional context does indeed have an impact on the risk judgements of experts. Kraus *et al*. (1992) were able to show that the attitude of health experts towards specific risk topics depends on their professional background in politics, industry or science. The authors (1992: 229 f.) comment:

"The affiliation bias we observed is particularly noteworthy, indicating that toxicologists working for industry see chemicals as more benign than do their counterparts in academia and government. Industrial toxicologists were somewhat more confident that other experts in the general validity of animal tests – except when those tests provided evidence for carcinogenicity – in which case many of the industrial experts changed opinions."

The results of an older study (Lynn 1987) point in the same direction but also showed that the political orientation (liberal/conservative) and election behaviour of the respondents have an impact on the risk assessment of experts. As far as we know, however there are no comparative studies of different groups of players and stakeholders specifically for Germany.

Risk communication between complexity reduction and target group orientation

If one sums up the problems of risk communication presented, then we can note that there are several problem dimensions concerning the communication of risk and hazard: specific misinterpretation within the framework of information presentation, the impact of contextual and world view determinants in risk judgements both amongst experts and laypersons and, last but not least, a lack of clarity when it comes to the understanding and use of terminology. Against this backdrop targeted risk communication must learn to understand the receiver in particular better. The elaboration of target group–oriented communication strategies, which

direct their communication contents and media more towards the needs, world views and action orientations of the target groups, seem to be promising. One key challenge in this context is the shift from complex scientific-technical risk assessments towards target group-oriented information processing.

3.1.6 Successful risk communication: Example implementation aids

Guides for the successful communication of hazards and risks are available in various forms. Most of them are intended for public authorities. In isolated cases companies or scientists are also the target groups. Existing action instructions, guides and practical aids vary considerably when it comes to the scale, form and depth of argumentation. There are detailed concepts for risk communication (Renn 2005) alongside simple handbooks intended solely for practice, so-called “easy-to-use pocket guides” (U.S. 2002). Furthermore, the guides focus on a large spectrum and different types of risk and hazard. They extend from genetically modified foods over threats of earthquakes down to hazardous waste dumps, electromagnetic fields, chemical products, breakdowns in industrial plants or threats of bioterrorist attacks. On the content level the ten guides examined in the literature search did nonetheless manifest major correlations. Hence they underwent at this point synoptic consideration as an independent subject of research in risk communication literature at the interface between science and practice.

Preconditions for successful risk communication
Generally speaking in the guides the major importance of mutual trust amongst the stakeholders is stressed as the contributory factor to effective and efficient risk communication. For instance the authors of an American guide (U.S. 1995) stress the need for public authorities to accept the general public as a legitimate partner in risk communication and to involve them in a trust-based manner. This stems from the realisation that the degree of credibility and trustworthiness of the risk manager determines to a major degree the success or failure of communication. The rewarding of these attributes by the general public can be achieved by the risk manager through empathy, expertise, honesty and commitment (U.S. 200: 25). A reputation of credibility must be nurtured as the highest good as once lost it can only be regained with luck and major effort (EPA 2002). The quality of the relationship between the stakeholders in the communication process is of decisive importance and, besides information design and dialogue format, it can be viewed as one of the main pillars of risk communication. In other words, “the social relationship is the humus on which communication contents can thrive” (Wiedemann 2000, Chapters 2.1 and 2.2). Trust building must take place in a timely and steady manner for instance via participation processes like the preventive establishment of a citizen forum and not left until after the damage has occurred (Störfallkommission 2005: 12).

Beside the fundamental principles trust, transparency and credibility, the guides stress in particular the form of communication. Many of the guides contain lists of rules of thumb for communication success. They clearly state that the content of the risk message will not be successful unless it comes in suitable, clever packaging;

“It was made clear from the beginning that designing the content of risk communication correctly is not sufficient to ensure success. In particular the communication process and the communication skills of those involved, are other essential (perhaps even more important) aspects” (Wiedemann/Schütz 2000: 40).

Receivers as a sensitive point in risk communication
The success of communication is often measured by how the receivers or target groups – be they organised stakeholders or individual citizens – are reached. The bridging of the discrepancy between the risk assessment by experts and the risk angle of laypersons is a major

challenge (Wiedemann 2000). Laypersons tend to overestimate the unusual risks featured in the media and to underestimate ordinary and familiar risks (Wiedemann/Schütz 2000: 39). The qualitative characteristics of the controllability of exposure, natural nature of the risk and perception by the censors of the risk play an important role in risk evaluation by laypersons (OECD 2002: 22; Renn o. J.: 45). Good risk communication must take this into account. Furthermore, it must be oriented towards the receivers' world views and make its messages clearer by means of illustration from the environment of the target group. Within pluralist societies the different nature of groups (e.g. religious or ethnic minorities) should be taken into account in risk communication (Renn o. J.: 45). Socio-economic or personal characteristics may influence risk perception, too. For instance, some male 20-year old men are the least worried about risks with a low probability of occurrence and high scale of damage. The conclusion here should not be the need to re-educate people.

"Sound public education doesn't change any of those "people factors". Instead it takes them into account and even takes advantage of them in designing the delivered information such that almost everyone generates questions about risks, options, changed opinions, and actions" (Mileti 2004: 2).

Risk communication problems, caused by understanding and use of the terms risk and hazard, are only discussed at a few points in the guides examined. Renn for instance says that risk communication should explain to the receivers the difference between hazard and risk by means of additional information on dose, exposure and contamination circumstances (Renn o. J.: 45). In addition, the OECD guide stresses the importance of exposure and dose in risk communication. It notes that consumers often confuse hazards with risks and were not clear about how the dose and the circumstances of exposure determine the actual risk. Simple examples could be a successful way of explaining to laypersons the difference between risk and hazard (OECD 2002: 22).

Instruments of successful risk communication

In the guides a number of instruments are proposed for the practical shaping of risk communication. The fundamental assumption is that risk communication was to be understood as two-way communication (Wiedemann 2000, Chapter Einleitung und Überblick; OECD 2002: 11). This implies the need for the regular involvement of stakeholders in the risk management process. The key topics of risk communication are then (co)determined by the questions and attitudes of the target groups (Wiedemann 2000, Chapter 2.).Renn sees risk communication between public authorities and social groups as an exchange of information on the data situation, the evaluation and interpretation of the risk under discussion. He mentions as possible instruments of stakeholder communication a hearing for the people affected, which must be staged early on in the risk management process and not prompted by statutory provisions. Secondly he mentions negotiations between socially important, supraregional groups with a view to including their values and interests in the decision-making process. Furthermore, round tables can be used as a discussion method in order to bring together public authority representatives and stakeholder representatives on a peer level for the purpose of reaching an understanding on a specific risk assessment. Moreover, entrenched negotiating positions in mediation procedures can be resolved by bringing in a neutral mediator for the mutual benefit of all those involved (win-win situation) (Renn o. J.: 44 ff.). Other guides mention as instruments flexible two-way communication within the individual citizens, public meetings, fora or panel discussions, exhibitions, Internet fora and events like open days. For the purposes of communication with interest groups, hearings, committees or consensus conferences could be considered with experts from these groups. Furthermore, interest groups could be involved in the communication process by means of round tables and mediation procedures (OECD 2002: 35; Störfallkommission 2005: 12).

Communication of contents: Example risk comparisons

As non-experts find it hard to understand quantitative risk descriptions on a cognitive level, the use of illustrative risk comparisons is an important form of communication (Wiedemann 2000, Chapter 2.3). Renn describes risk comparison in the following way, "risk comparisons endeavour to place a risk situation, which is not tangible for the target group of communication, in relationship to other risky incidents. The risks for comparison are selected if at all possible from the (everyday) experiences of the target groups." (Renn o. J.: 67). To avoid being suspected of misleading people, of playing down the risk or people's feelings of concernedness or violating their privacy, the risk manager should be very careful when using risk comparisons (Renn o. J.: 68f; OECD 2002: 22). These comparisons merely serve the purpose of illustrating abstract probabilities; however they should not – not even indirectly – contain any judgement about the acceptability of specific risks (OECD 2002: 22). Hence the demand would have to be deemed to be counter-productive that all risks are to be seen as acceptable which are not higher than other risks already accepted in everyday life (Renn o. J.: 67). Wiedemann/Schütz define risk comparisons as appropriate and promising when the data sources are credible, the situation is not emotionally charged, the risk manager also accepts subjective factors of risk assessment as legitimate and when the comparison is solely used for the purpose of illustrating the facts (Wiedemann/Schütz 2000: 40). Renn formulates a number of practical aids for the use of risk comparisons. For instance when comparing sizes the same measurement units should be used and numbers should be depicted in a clear manner using language or images. Not only should the risks be compared on the basis of comparable scientific data quality, the intention of the risk comparison should be clearly indicated, too (Renn o. J.: 70ff). By way of conclusion it can be observed that the complexity, imponderability and also explosive nature of the overall risk communication process can be depicted using the communication form of risk comparison. Hence Renn observes about risk comparison, "Successful risk comparisons are indeed a question of good handicraft but frequently also a matter of luck" (Renn o. J.: 73).

Dealing with the media

Public media influence public opinion in pluralist societies. They share a role in deciding which events and information are newsworthy. In this way, they influence the agenda of the political system. When selecting newsworthy events they use criteria like topicality, dramatics, consequences or emotion. Risk information is translated by the media into everyday language in order to shorten complex technical details and enhanced by the "human" factor in order to communicate. In his cooperation with the media the risk manager should bear in mind the fact that the news value of a risk topic frequently has very little to do with the scale of the threat to the environment or health. What is more important from the media perspective is for instance less the topic itself than the related questions of guilt, fear and anger. Furthermore, warnings and a direct hazard situation are given more media coverage than the sounding of the all clear (Wiedemann/Schütz 2000: 42f). The risk manager must adopt an proactive stance on the image, specificities and functioning of the media as a positive relationship to the media and journalists is essential for the success of his communication (U.S. 2002: 35). The guide of the US Departments of Health and Human Services gives the risk manager diverse practical tips and action recommendations particularly when it comes to dealing with reporters and the right behaviour in an interview situation (U.S. 2002: 35ff). Mileti recommends using different media channels for the dissemination of a risk message at the same time. In this way the message can reach as wide an audience as possible (Mileti 2004). The risk communication handbook of the Food and Agriculture Organization (FAO) explicitly points out that the writing of letters by scientists was an effective way of entering into contact with and engaging in an exchange with journalists. At a later point they could then possibly be contacted by them as a source of information for specific topics (FAO 2005: 24). The tenor of the guides – this is how it can be summed up – is that they stress the outstanding importance of the media as multipliers of risk messages. Risk managers should take note. In other words, "Meet the needs of the media. Never refuse to work with the me-

dia. The media's role is to inform the public, which will be done with or without your assistance. Work with the media to ensure that the information they are providing the public is as accurate and enlightening as possible" (U.S. 2002: 27).

3.2 Interpretation of the results

Despite being a relatively "young" area of research, risk communication research is extremely diverse and differentiated. Although the roots of risk communication research are to be found above all in North America a research landscape on risk communication has since become firmly established in Europe too, not least in Germany.

The literature analysis has shown that the stakeholders in communication either do not use the terms "risk" and "hazard" at all or inconsistently. The results of the literature analysis are presented and evaluated below as theories.

Risk communication: Difference as a structural characteristic?
Communication about risks – whether in the spotlight of media interest or not – is done with the involvement of a number of stakeholders. Communication takes place in several directions although it is often difficult to establish who assumes the role of communicator and/or receiver. The literature analysis has shown that six types of stakeholder can be distinguished on the analytical level. The location of the individual types of stakeholder in the communication process indicates that stakeholder-specific communication needs and demands exist independently of where they are located in the area between risk cause, avoidance and concernedness. Communication about risks always entails discussions about responsibility for the cause and the need for avoidance as well as about the information obligation and scale of concernedness. As a rule can they can mainly be attributed in an individual risk or hazard event to specific groups of stakeholders. Against this backdrop risk communication by public authorities should take on board the differences in stakeholder perspective as well as their respective location in the communication process as structural characteristics.

Stakeholders between their own world views and a factual orientation
It became clear that risks and hazards are perceived very differently depending on the stakeholder angle. Their own world views play a major role in their specific perception of risks. Depending on the stakeholder role various factors may be dominant: for instance economic interest, responsibility for hazard avoidance and precautionary measures or "watchdog and spokesperson function". The perception of risks from these different angles has a major impact on the way they are communicated. A risk is interpreted very differently depending on the stakeholder perspective and then communicated correspondingly. Different risk concepts merge into different contents and forms of communication.

On the other hand, a factual orientation i.e. objectification on the basis of scientific-technical knowledge serves as a bridge for interpretation and communication differences – in a situation where a relatively similar assessment is possible on the basis of robust knowledge. The "bridging function" of factual knowledge for cross-stakeholder understanding is very closely linked to the level of knowledge or non-knowledge. This leads to the theory: the higher the level of knowledge about a specific risk or hazard case, the more likely cross-stakeholder understanding is. To put this another way: the more knowledge gaps there are, the greater the likelihood of fundamental understanding and communication problems. This touches on the crux of communication of the terms risk and hazard as the level of knowledge is of decisive importance in the case of these terms. When it comes to risk identification, a high level of knowledge can be assumed as validated knowledge about dose-response relationships, probable occurrence and level of exposure must be present quasi *per definitionem* in order to be able to describe the situation as a risk. When it comes to the identification of a hazard, by

contrast, gaps in knowledge may be a major contributory factor to the difficulty in classifying a hazard as a risk. For risk communication by public authorities this means that concrete hazards are far more susceptible to communication and understanding problems between the stakeholders than the communication of concrete risks.

4 Results II: Empirical evaluation - expert interviews and focus groups

4.1 Presentation of results - expert interviews

4.1.1 Presentation of expert sample

Composition of expert sample
Questionnaire-backed expert interviews were conducted with a total of 26 representatives from public authorities, professional associations, environmental associations and consumer organisations between December 2006 and February 2007. The expert sample is relatively evenly distributed over the groups of stakeholders. Nine interviews were conducted with both stakeholder groups industry and civil society (i.e. environmental and consumer associations) and eight interviews with public authorities.

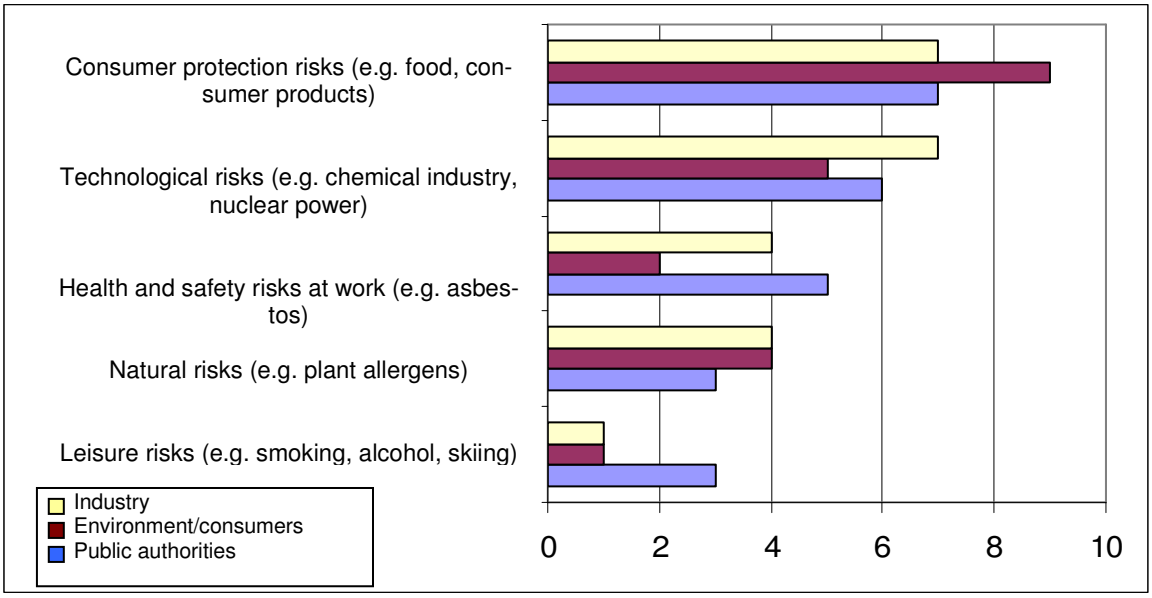
In the stakeholder group *public authorities,* six federal authorities and two *Land* authorities were interviewed including both ministries and downstream public authorities. The main focus of public authority work is on aspects of environmental, consumer and health protection.

In the stakeholder group *civil society,* consumer protection and environmental associations were included in the survey. Five consumer protection organisations and four environmental associations were interviewed. The consumer protection organisations included both partially state-financed organisations and mainly self-financed ones. As a rule the NGOs interviewed operate on a nationwide level or act as an umbrella organisation. The areas of activity of the civil society stakeholders are the representation of environmental and consumer policy interests as well as the provision of information and consultancy services particularly to their own members.

The stakeholder group *industry* is composed to one third of cross-sector professional associations with a focus on production and commerce, sector-specific professional associations in the field of food and companies involved in the agricultural and insurance industries. All the associations approached are the respective umbrella organisations on the national level. The main areas of work of the professional associations are general or specific representation of their members' interests in political circles and to the public at large. Three of the companies interviewed are large companies that operate globally and have their registered office in Germany.

When asked about **which risk topics** the stakeholders are currently involved in the field of risk communication, there is a clear predominance of the topics consumer protection risks and technological risks (cf. Fig. 5). Hence all environmental and consumer protection associations and almost all public authorities and industry representatives deal in an extensive manner with consumer protection related risks particularly in the area of food. An expert sample was then selected and compiled that has widespread expertise in consumer health protection – a core area of the work of BfR. It was shown that public authorities cover a wider spectrum of risk topics in their risk communication than other stakeholder groups. Industry and civil society stakeholders seem to focus more on specific risk topics. This must, however, be seen against the backdrop of organisation size. The number of staff in public authorities was for higher than in the associations from industry and civil society, which generally employ (far) fewer than 50 people in their central offices.

Fig. 5: Expert sample – Risk topics addressed



Question: "For which topics (both "risk" as well as "hazard") are you or your institution currently involved in risk communication? (Multiple mentions possible)
Answer option: yes– no
X-axis: Frequency

Characteristics of the respondents

Mainly **decision-makers** in executive positions were included in the survey. In particular for the stakeholder groups industry and civil society they were generally either managing directors or department/division heads. In the case of public authorities mainly division or department heads were interviewed. Where this was not the case, experts holding the position of a scientific member of staff with specific expert knowledge and duties in the field environmental policy and health consumer protection were interviewed.

All representatives in the expert sample have academic training. If one asks about their **educational background,** there is a clear predominance of the natural sciences. More than two-thirds of the respondents can be assigned to the natural sciences. The others are evenly distributed between business, social sciences and law – the latter to be found particularly amongst industry representatives. The area of the natural sciences is dominated by training courses in the field of food. There are several food chemists and agricultural engineers; in isolated cases we also find representatives of the disciplines food and biology.

In the case of the most important **duties of the respondents or their institutions,** a stakeholder group specific pattern can be recognised. *Representatives of public authorities* stressed the following as being the most important areas of their work:

- Bringing together various stakeholders (coordination and mediatior function),
- Organisation of regular monitoring,
- Preparation for the occurrence of a potential risk,
- Identification of problematic harmful substances,
- Early risk detection, evaluation and assessment,
- Monitoring and control function (risk management),
- Responsibility for the national and international flow of information from public authorities.

It becomes clear that public authority representatives cover the entire spectrum of risk policy from (early) risk detection over risk evaluation, assessment and management down to responsibility for information and dialogue particularly between responsible public authorities.

In contrast, *environmental and consumer associations* stress their responsibility for independent, consumer driven awareness-raising and information work. To guarantee this, potential risks must be identified, described and classified. This procedure is mentioned by various representatives of the environmental and consumer associations. It involves the processing of the scientific debate on risk assessment and, based thereon, the elaboration of target group-oriented consumer communication combined with the identification of promising solutions. One important goal that was mentioned was maintaining consumer trust. Some associations have a formalised procedure for developing communication platforms and crisis teams, for establishing consultancy points of views based on scientific results and using various communication media (e.g. print media, Internet, television etc). In the associations interviewed the focus is very much on the product group food and household products (e.g. cosmetics, toys).

The most important tasks of the *professional associations and companies* involve representing their interests on the inside and outside (particularly vis a vis political circles), their own work on risk assessment and, for the associations, the propagation of increased risk responsibility through companies along the entire value chain. The external representation of association interest encompasses support for and commentaries on statutory framework conditions, mediation between public authorities involved in the risk assessment of specific product groups (e.g. pesticides) and in general the external representation of the industry. Vis a vis their own members a communication function is primarily exercised by informing (member) companies about the latest scientific findings and political developments. The area risk assessment encompasses two things: firstly the conduct of generic research by companies and branch associations; secondly the communication of these results to the responsible public authorities. The subject areas of risk assessment are mainly sector-specific products (e.g. food, pesticides, chemicals). New environmental and health-related risks repeatedly move centre stage of interest, for example the possible hormonal effects of environmental substances (so called “endocrine effects”[7]) or noise pollution.

4.1.2 Risk concepts: Stakeholder views in risk communication

Risk communication: Understanding and central tasks of the stakeholders

What do the respondents understand by risk communication with public authorities? The answers given by *representatives of the public authorities* cover different aspects of public authority risk communication. Risk communication is, for instance, seen as an ongoing **participatory process** across all phases which “is not undertaken in purely scientific ivory towers but also shaped by ongoing reflection with partners […] risk managers and risk assessors must work together in an ongoing dialogue even during the genesis of risk assessment to ensure that the results also correspond to the requirements of the respective process.” According to this understanding risk communication is already part of risk assessment and risk management. This applies in particular to formalised procedures like, for instance, marketing authorisation procedures where an extensive exchange should be sought with applicants and the responsible public authorities. It should be noted that risk communication is seen as cooperation with the public authorities responsible for assessment, examination and monitoring, with the consumer side (associations, individual consumers) and with industry (associations and companies).

ORIGINAL SOUND PUBLIC AUTHORITY
“The task of public authorities is to provide unbiased, objective, intelligible and target group-oriented information.”

[7] Endocrine effects describe the influencing of the hormonal control mechanism of the organism by foreign substances (oestrogens, gestagens, androgens). In scientific circles the impact of environmental chemicals with estrogen-like action on the reproduction ability of humans is under discussion.

Risk communication is an **ongoing learning process** for all stakeholders. In this context, reference was made to the communication handling of nanotechnology. Against the backdrop of the debate about genetic engineering that was deemed a communication failure, the public authorities responsible for risk communication should tackle the topic nanotechnology in a far more proactive way and render transparent the comprehensive discussions about the level of knowledge of (consumer) advantages and possible risks. One key aspect of risk communication is the **exchange of information**. Public authority representatives have stressed in particular the exchange of information between public authorities and applicants (i.e. companies); an information responsibility vis a vis the general public is mentioned less frequently. One representative of a downstream public authority observed, "We do not see it as our task to go to the general public without a specific reason and engage in what is generally understood to be risk communication. Of course we talk to other stakeholders about the risks we expect." When interpreting this statement it should, however, be borne in mind that the functions and tasks assigned to public authorities in risk communication differ; for instance the Federal Institute for Risk Assessment was explicitly assigned the task of risk communication – also in legal terms – whereas it is not one of the central or statutory tasks of other public authorities.

ORIGINAL SOUND NGO
"Talk about the assessment and classification of dangers and risks."

Environmental and consumer associations understand risk communication with public authorities to mean more particularly **public authority communication responsibility** vis a vis all stakeholders. Public authorities, therefore, have the task of "informing the public about risks and raising awareness". It is expected that when a hazard is identified, this is communicated to all stakeholders. What civil society representatives would like to see is proactive communication behaviour with a duty to inform along the lines of a public authority duty to provide. The communication should:

- indicate that there is a problem;
- name the uncertainties and clarify the information obtained;
- present the measures seeking to reduce the hazards and risks.

It was stressed that the estimation of risks and hazards should also take into account ethical and social aspects; this played a major role in risk perception by the population at large as demonstrated by the debate about genetic engineering. One obstacle to good public authority risk communication that was identified was that public authorities communicate in a very cautious manner because of the current legal situation (threat of liability).

Business representatives also see risk communication first and foremost as a **communication task of public authorities.** Public authorities should communicate how realistic the dangers are for the environment and health which may be linked, for instance, to substances. To this end, knowledge should be obtained about situations that may be potential sources of information for consumers. Business representatives distinguish very clearly between different target groups of public authority risk communication. This encompasses communication between public authorities as well as vis a vis the general public and the people who are actually affected. For industry itself it was observed that reliable risk communication was very important without premature political assessment.

The experts were also asked about the **central tasks** of the three groups of stakeholders in risk communication. The interview partners were asked to indicate the central tasks for the three stakeholders: public authorities, professional associations and companies, and environmental and consumer associations. Table 5 sums up the results from the angle of the three groups of stakeholders. If one looks at this, then two things become apparent: firstly the central tasks which were assigned by the respondents to each group of stakeholders are surprisingly coherent – there are differences at best in the range of tasks; secondly clear differences can, however, be observed in the stakeholder-specific task profiles.

Table 5: Central tasks of stakeholders in risk communication

…of public authorities	… of professional associations/companies	… of environmental and consumer associations
… from the angle of public authorities		
• Identification, assessment, management and communication of hazard/risk • Carrying out statutory tasks for specific risk topics • Intelligible and comprehensive information for all stakeholders • Decisions and preparation of decisions for political circles about the question of acceptable risks • Mediator function for contradictory interests	• Identification of dangers and establishment of suitable measures to contain these dangers • In a crisis taking counter measures and providing information to the public at large and public authorities • Major role in the risks for which they are responsible (information duty, risk management)	• Keep negative impact away from consumers. • Information source for individual consumers through cooperation with public authorities and industry • Supply specialist information and pass on information to citizens • Communication of the fears and concerns of consumers to political decision-makers (“spokesperson of consumers”)
… from the angle of environmental and consumer associations		
• Timely concrete and honest information about risks and hazards (where appropriate change in the legal situation) as an active information obligation • Generation of fact base, risk control and market monitoring • Scientific assessment and legal containment of risks (protective measures, limit values)	• Provision of low risk or risk-free products and services • Active, transparent information obligation about hazards and risks of products vis a vis public authorities and the public at large • Responsibility goes beyond statutory conditions • Risk management for products	• Represent consumer interests in politics • Communicate information diversity in such a way that it is adequately perceived by consumers • Draw consumer attention to risks and act as a “critical voice” in risk assessment • Provide information about dangers and risks to public authorities
… from the angle of industry		
• Assess and observe risks, exercise risk control (preventive and restrictive) • Transparent, informative handling of risk identification and assessment • Specified criteria for protection goals • Protect people from hazards for which they are not themselves fully or only partially responsible • Pass on information to risk managers	• Risk management and consumer information for faulty products • Input of expertise and data for risk analysis and assessment • Communicate to own customers about how to safely handle products • Pass on findings from risk assessors to members	• Inform public and draw attention to risks • Environmental and consumer associations should advise the public at large on a scientific basis and be included in the risk assessment decision-making process • Control of control

Public authorities have the most comprehensive task profile. They are responsible for the identification, assessment, management and communication of hazards and risks. The central task of industry is risk management in the case of hazards and risks (product responsibility) for which they are themselves responsible and the communication of product-specific technical knowledge to public authorities for the risk assessment and customer-specific product information on safe use. Environmental and consumer associations, by contrast, are almost all solely assigned communication and control responsibility along the lines of representing the interests of consumers.

Understanding of the terms: risk and hazard

The expert survey focused on questions of the understanding, handling and use of the **key terms "risk" and "hazard" for risk research.** The goal was to highlight various argumentation patterns, understandings and use contexts in order to identify possible problems and misunderstandings of the stakeholders involved in the communication process and to understand this better. Various questions were designed to examine this research question in the questionnaire. Initially, the experts were asked in an unaided manner about their understanding of the terms and the use of the working definitions for these terms in their work environment. In a second phase the respondents were asked to attribute various aspects like probable occurrence or scale of exposure to the two concepts and to assess the customary working definitions of BfR. Furthermore, they were asked whether differing use of these terms could be observed amongst the three stakeholder groups: public authorities, industry and civil society and whether there were any other terms that lead in the field of risk assessment and communication to understanding and communication problems.

Initially about the **understanding of the terms:** Table 6 gives by way of example statements on the two terms "risk" and "hazard" from the angle of the three groups of stakeholders. What is initially noticeable is that *public authority representatives* on the whole gave very coherent and congruent answers about the two terms.

ORIGINAL SOUND PUBLIC AUTHORITY
"Prior to talks with the stakeholders, the terms must be defined; public authorities agree on the definitions."

Almost all experts from public authorities based their answers on a toxicological understanding of the two terms according to which hazard encompasses the inherent properties in a substance whereas risk is the product of the probable occurrence and scale of damage. Furthermore, it was stressed that hazard can be estimated relatively well but that the risk and the scale of damage can scarcely be calculated in advance. The results confirm the statement of a public authority representative that there is major agreement amongst public authorities when it comes to the understanding of the two terms. Asked whether there were any working definitions for these terms in their daily activities, almost all public authority representatives mentioned the European Regulation No 178[8] from 2003. Knowledge of this statutory provision was very widespread amongst the respondents.

[8] REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT OF THE COUNCEIL laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

Table 6: Understanding of the terms "risk" and "hazard" by risk communication stakeholders

Hazard	Risk
Public authorities	
• Hazard is a system-inherent danger. • Rather in the routine area, always present, can be assessed relatively well. • From the toxicological angle this is the inherent potential of a substance. Actual exercise of this potential dependent on exposure, the scale of exposure and other factors. Can be described relatively concretely by experiments. • Chemical, physical or biological agent or property of a food, which is capable of leading to a threat to health. • Hazard means something can happen but does not necessarily say how large or probable the potential damage is.	• The probability that a danger will occur and can harm the health of consumers • Goes beyond the normal degree of hazard, probable occurrence less calculable, scale of damage less clearly discernable in advance • Characterised by the possibility that a hazard/problem may occur which is far less easy to calculate • Effect plus exposure and frequently extrapolated to the probability that a person will suffer some harm • Always a function of the probability that there will be a negative effect on health
Environmental and consumer associations	
• Possible property which a substance or product may have (in the case of chemicals for instance toxicity) • More substance consideration: where there could be something in the product that under certain circumstances could constitute a threat to health • Rather a more concrete danger: hazard is a "harder" description for the relevance of a hazard (substance is hepatotoxic) • From the emission side possible hazards (assessment of source of emission) • Legal term with a distinction between danger and hazard: danger as harm that occurs with sufficient probability: hazard is the presence of a danger of this kind	• Consideration of the use of the product, inclusion of exposure scenarios • Is the theoretical probability that something can happen • General risk about which we don't know very much (e.g. nanotechnology) • Is more potential: initially deemed to be a risk but then turns out not to be a risk • A threat perceived by an individual (subjective assessment) • Estimation of the probability of the occurrence of damage (insurance-based understanding) and the level of damage
Professional associations and companies	
• Abstract: what is in a substance and can develop in a certain situation • Inherent properties of substances or products • Broad understanding: use along the lines of harmfullness whereby the level of damage is taken into account • More concrete: scale of a potential danger which may be linked to a substance or process • What effects something actually has on man and the environment (actual danger)	• More concrete: tied to environs; when a certain activity with hazard potential leads to which consequences • Product of probable occurrence and scale of damage • Broad understanding: consideration/weighing up of possible benefits and damage • More abstract: possibility that a substance may constitute a problem in the final instance • What a chemical can do; for instance a chemical in a closed container (possible danger)

This is partly different in the case of the representatives of *industry* and *civil society.* It is true that here the two terms were defined "toxicologically" by the individual respondents. However, toxicological understanding was also used in the opposite direction. This means that the properties of the risk trigger contributed to the term "risk" and the actual impact on man and his environment. There are other comprehension dimensions: for instance concrete vs. abstract, actual vs. theoretical vs. legal differentiation of the terms (as legal category). For the definition of the term risk, the individual and subjective perception of a threat was also used as was consideration of the risk-benefit reflections as definition characteristics. In isolated cases both terms were also equated with content, i.e. no definition-based distinction between the terms. Furthermore, there are no (internal) working definitions for the terms nor did the respondents refer to statutory definitions.

Conclusion: the understanding of risk and hazard is far more heterogeneous amongst the respondents from industry and civil society; there is no formalisation of the working definitions. No stakeholder-specific differences in understanding could be observed between these two groups.

Furthermore, many business and civil society experts referred to the **minor relevance of these terms** in their working environments. Below a few statements of respondents on this important finding:

- In the German language there are no major differences between these terms; they may be more apparent in English.
- Beyond all terms decision-making boundaries are important: i.e. from what point onwards the state has to do something and when it doesn't.
- In practice the terms are irrelevant; this abstract understanding is scarcely usable.
- The distinction makes sense on the assessment level but is irrelevant for the communication level because it cannot be taken on board in a target group-compatible manner.
- There is no differentiated consideration of the terms; people tend rather to use the term risk and think more of a concrete example.
- This distinction scarcely plays any role at all in practical work.
- Terms are used in conjunction with statutory requirements (e.g. pesticide residues). No distinction is made in risk communication.
- Example contaminants: for consumers the question is "contaminant or not"; any more comprehensive differentiation cannot be communicated to consumers."

In a second question on this theme complex, the experts were presented with some aspects and asked to attribute a risk and hazard to these terms on a numerical 7-point scale. The goal was to determine the different understanding of the **definition characteristics of the terms** amongst the respondents. The criteria used can be very clearly assigned based on toxicological understanding of the two terms. Probable occurrence of damage, scale of damage and level of exposure belong to the term risk. Dose-response relationship, properties of the risk trigger and toxic effect, in contrast, are attributed to the hazard.

However, the three last mentioned criteria can also be identified for a risk: when the concept pair hazard and risk are understood as a causal relationship in space and time. In this case the occurrence of a risk is the consequence of a previous hazard. Hazard is, therefore, a necessary condition for a risk. This does not apply to the reverse case. A hazard can become a risk but doesn't have to. This is the case when, for instance, a substance has theoretically harmful properties but the substance only occurs for instance in such low amounts that it practically can't have any harmful effects on health. Table 7 shows, on the basis of toxicological understanding, the attribution of the criteria to the two terms. The attribution in brackets of the last three criteria to risk depicts the above-mentioned situation.

Table 7: Criteria of "risk" and "hazard" from the toxicological angle

	Risk	Hazard
Probable occurrence of damage	X	–
Scale of damage	X	–
Level of exposure	X	–
Dose-response relationship	(X)	X
Properties of risk trigger	(X)	X
Toxic effect	(X)	X

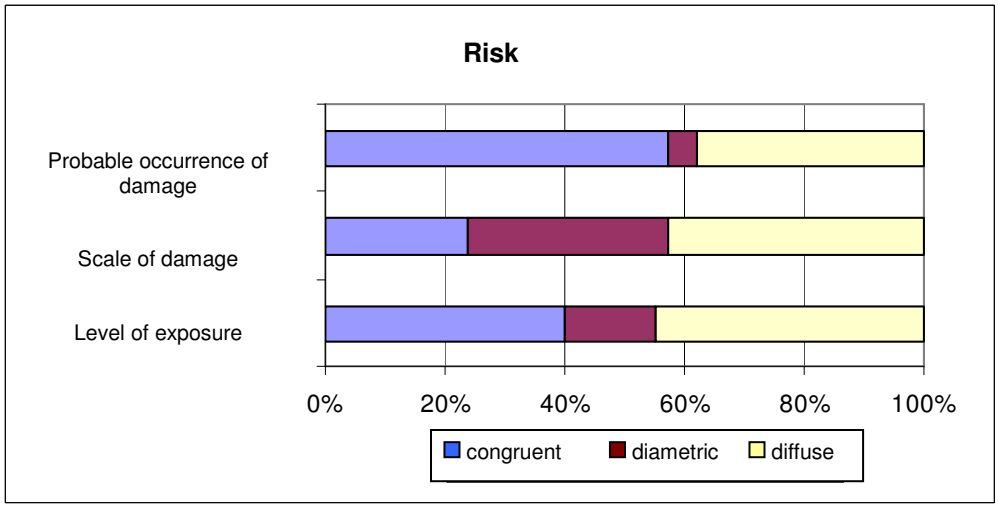
Source: own depiction

Three types were formed for the evaluation of this question, which aim to depict the different understanding of respondents;

- **Diffuse understanding** is when the relevance of the individual criteria means **congruent understanding**: the individual aspects were very clearly distinguished from one another and clearly attributed either to risk or hazard. In the assessment there is then numerically a major difference in attribution (for the evaluation a difference ≥ 4 was taken as the basis). Attribution was then undertaken as in Table X. For instance if the definition characteristic “scale of damage” was assigned the number 6 by a respondent for risk and 2 for hazard, then this was deemed to be a congruent understanding.
- **Diametric understanding**: here, too, definition characteristics were rated very differently in terms of their relevance for the two concepts (here too a difference ≥ 4 was taken as the basis). The attribution of the individual aspects was undertaken in opposition to the toxicological understanding outlined above. In concrete terms this means: if the criterion “scale of damage” was assigned 2 for risk and 6 for hazard, then this was deemed to be a diametric understanding.
- For both terms the assessment was the same or very similar, i.e. the importance of a criterion for a risk and a hazard scarcely deviated. For the assessment of a risk a difference ≤ 3 was taken as the basis. When evaluating hazard it must be born in mind that the aspects dose-response relationship, properties of the risk trigger and toxic effect – as outlined above – can be attributed to both terms. A diffuse understanding of hazard was assumed when the assessment for both risk and hazard was ≤ 4.

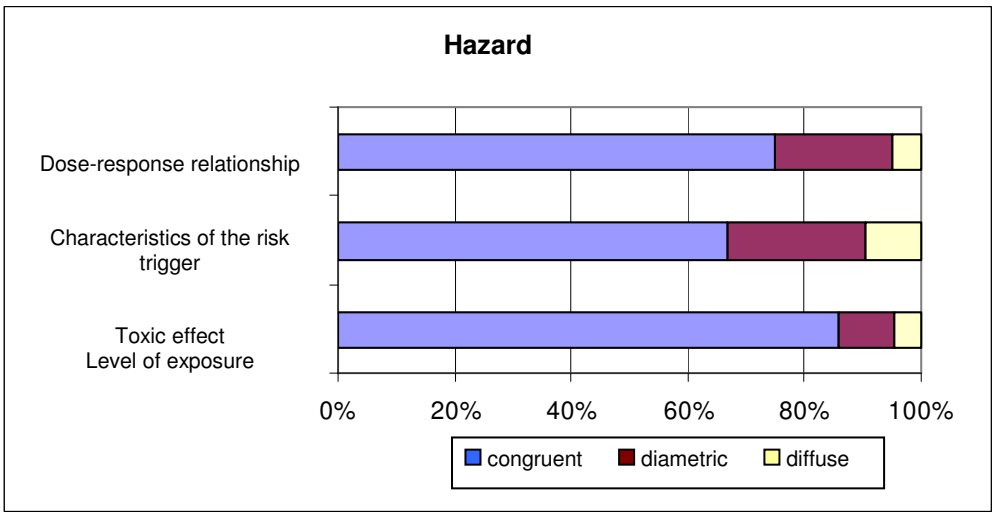
Figs. 6 and 7 show the results of the survey. What is noticeable initially is that the definition characteristics – probable occurrence, scale of damage, level of exposure – that belong to risk were classified by almost half of the respondents as a sole characteristic either of risk or hazard. A congruent understanding is only found in the case of the probable occurrence of damage, which the majority of experts clearly attributed to risk. In the case of level of exposure and more particularly scale of damage, the attribution to risk is far less clear. Quite the contrary: the scale of damage is seen more as being a definition characteristic of a hazard than of a risk. What is also noticeable is that around 40% of the respondents do not make any clear distinction between the criteria which means that a diffuse understanding is predominant.

Fig. 6: Congruent, diametric and diffuse understanding of risk



Question: I would now like to give you some aspects and ask you to estimate their importance for the terms risk and hazard. In you opinion what are important for each concept?
Answer option: Scale of 1= “not important at all” up to 7= “very important”
Evaluation rules: 3-typology:
- congruent: difference ≥ 4 with a higher value for risk
- diametric: difference ≥ 4 with a higher value for hazard
- diffuse: difference ≤ 3

Fig. 7: Congruent, diametric, diffuse understanding of hazard



Question: I would now like to give you some aspects and ask you to estimate their importance for the terms risk and hazard. In you opinion what are important for each concept?
Answer option: Scale of 1= “not important at all” up to 7= “very important”
Evaluation rules: 3-typology:
- congruent: difference ≥ 4 with a higher value for risk
- diametric: difference ≥ 4 with a higher value for hazard
- diffuse: difference ≤ 3

The results for hazard indicate that there is not any clearly congruent understanding amongst the experts either. However, it should be stressed that the evaluation results for risk and hazard are **not comparable** because of the different evaluation rules for the diffuse understanding type. What is particularly noticeable is that the criterion "characteristics of the risk trigger" fares the worst – that was unexpected. The dose-response relationship and, in particular, the toxic effect are more clearly attributed to hazard.

What about the **stakeholder-specific differences and patterns** in the understanding and use of the terms risk and hazard? The experts were asked whether they see a different understanding and use of the terms amongst the three groups of stakeholders. The depiction of the results initially distinguished between a uniform and a different understanding and use of risk and hazard. For both categories the answers of the respondents are systematically attributed to explanatory factors and weighted in terms of quality on the basis of the frequency of answers.

No differing use:
Only very few experts noted that there is a clear understanding or a clearly separate use of the terms risk and hazard by public authorities, industry and civil society.

Explanatory variables
- **Undifferentiated definitions** of the terms: if no differentiation was observed between the groups of stakeholders, then this was based on an "undifferentiated use of the terms". It was observed that "only very few are able to make a reasonable distinction or are prepared to do this". Far more it was pointed out that many terms are used as synonyms.

Different use:
A clearly different use of terms was observed, in contrast, by the large majority of respondents. According to them major differences in the understanding and use of risk and hazard can be observed. What reasons were given for this?

Explanatory variables
- **Interest orientation:** stakeholder-specific own interests were mainly given as the reason for the different use. All stakeholders have their own interests, fears and anxieties, which are the basis for their orientation. From the angle of public authorities, industry assesses acute hazards/risks *appropriately* whereas long-term ones are underestimated. Furthermore, hazard is always qualified by saying that there was no risk to the population. Behind this there are business interests about product brands and drops in sales revenues. Civil society experts, too, suspect own interests of industry which means that they interpret risk against the backdrop of marketing and statutory regulations and use risk communication as a type of "calming strategy". For public authorities it was observed that the influence of political circles on specific topics was clearly visible and they were interested first and foremost in the correctness of the choice of procedure and compliance with statutory provisions.

Original Sound Public Authority
"I believe that in civil society the topic plays a far less important role with regard to a structured definition than amongst industry and public authorities."

- **Different risk perception:** The importance of subjective risk perception was stressed in particular for consumer and environmental protection associations. From the public authority angle civil society representatives rate each risk as high whereas the probable occurrence is not considered enough. Furthermore, there is a very major focus on hazard with reference to preventive environmental and consumer protection. Industry representatives also observe in the case of environmental and consumer associations an overestimation of non-influenceable risks because of concernedness whereas the benefits related to the risks

Original sound Industry
"Public authorities largely follow the civil society perception because of the influence of the media."

are not taken into account enough. The self-assessment by civil society experts goes in the same direction. Concernedness plays a major role for them; they react far more sensitively and anxiously.

- **Expert knowledge orientation:** some respondents clearly indicated that the terms were not used differently on the basis of the stakeholder affiliations. There were no stakeholder-specific but there were knowledge-specific differentiations that are transversal to the stakeholder dimension: “In the case of those people who deal with this topic, the understanding is the same or a corresponding agreement has been reached. In the case of people who are less involved, there may be different use and understanding of the terms” – these were the comments of one public authority representative. One consumer protection expert also observed, “No difference between stakeholders but in terms of expert knowledge: in each group of stakeholders there are informed and less informed people (“layperson vs. experts”)”.
- **Diffuse understanding of the terms:** the decisive factor for different use is also diffuse understanding of the terms amongst all stakeholders, “Because of inexact knowledge of the terms, a bigger distinction is made between the groups and the terms are confused”.
- **Institutional differentiation:** Finally, reference was also made to the institutional differentiation or division of labour between the three groups of stakeholders. This can be attributed to the fact that “risk assessment is undertaken first and foremost by public authorities and industry through analysis and controls whereas risk/hazard by NGOs is scarcely mentioned any more to consumers.” On several occasions it was noted that understanding and use by public authorities and industry are closer whereas in the case of NGOs this deviated to a marked degree “the line runs between civil society – safety equated with zero risk/hazard – and public authorities/industry who in their general understanding see a safe risk as being below a socially accepted risk. One reason for the dividing line between public authorities/industry and civil society could also be the far more formalised cooperation between public authorities and industry for instance within the framework of risk assessment in conjunction with marketing authorisation procedures in which NGOs are far less involved.

If one sums up the results (cf. Table 8), a non-differentiated understanding of the terms is mainly responsible for the non-uniform use of the terms by the groups of stakeholders. When experts observe different use, then this can be attributed above all to the interest orientation and different risk perception. But the technical knowledge orientation is another decisive factor particularly as the differences in use cannot then be explained on the basis of stakeholder but of level of knowledge.

Table 8: Terms risk and hazard, explanatory variables for (non-)uniform use in risk communication

Uniform use	
Non-differentiated definition	o
Different use	
Interest orientation	+
Different risk perception	+
Technical knowledge orientation	+
Diffuse understanding	o
Institutional differentiation	–

= weak 0 = average + = high

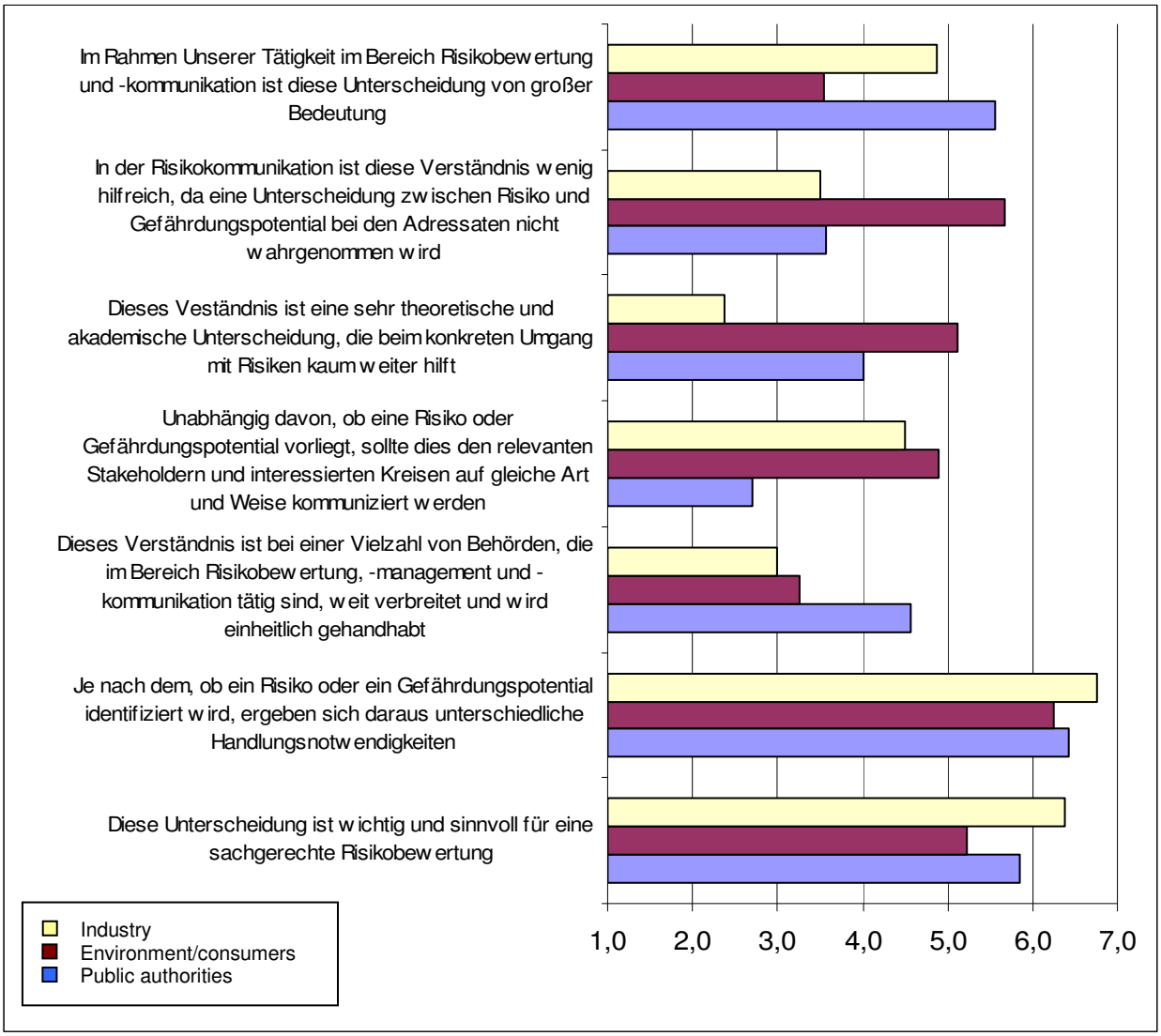
Source: own depiction

How do the respondents estimate the **BfR definitions of risk and hazard?** For this question the experts were given the following BfR definitions and asked to rate them in conjunction with specific statements:

- The term **hazard** describes the potential of a substance (chemical) in toxicology to cause an adverse effect. Dose-response relationships are the basis for this.
- The term **risk** is the product of the scale and probable occurrence of damage. Exposure data are the basis for probable occurrence.

Fig. 8 presents the results of this assessment broken down for the three groups of stakeholders. It reveals that the definitions based on toxicological understanding are very important for the public authority's own risk assessment – but far less important for industry. The situation is different for environmental and consumer protection associations. They see this distinction as being far less important. This also reflected in the general estimation of the differences in terms in communication. NGOs believe this distinction is less helpful as it is scarcely perceived by the target groups. Industry and public authorities rate this in a far more sceptical manner. It should be borne in mind that each of the three stakeholder groups has (may have) different communication receivers in mind. The highly exaggerated statement that this understanding was a very theoretical and academic distinction that was scarcely helpful when dealing with risks was approved to a major degree by NGOs. Surprisingly, public authorities also rate this distinction as being not very helpful for the concrete handling of risks (risk management). By contrast, industry representatives did not agree with this estimation. How should risks and hazards be communicated? NGOs and industry are almost all of the opinion that the type of risk communication should not focus so much on the existence of a risk or hazard. However their approval rating (NGOs: 4.9; industry: 4.5) is moderate. In contrast public authorities fear to a major degree the orientation of risk communication towards risk and hazard. Industry and NGOs can scarcely confirm the widespread use and uniform handling of the terms risk/hazard by public authorities whereas public authorities tend to claim this for themselves. There approval values are not, however, so high which means that there may be major scepticism behind this. All three groups of stakeholders agreed that, depending on the identification of a risk or a hazard, there are clearly different action needs for risk management. This is where the highest approval rates were achieved. The situation is similar for the assessment whether the risk/hazard distinction is important and makes sense for proper risk assessment. Industry/public authorities supported this to a major degree as did the NGOs.

Fig. 8: Assessment of the BfR definitions of risk and hazard



Question: The Federal Institute for Risk Assessment (BfR) distinguishes between the terms risk and hazard. This can be briefly described in the following way: -cf. above
Please give me your estimation of this understanding?
Answer option: *Scale of* 1 = “completely disagree” up to 7 = “completely agree” (x axis)

If one sums up the results this shows that for risk assessment and risk management the identification of a risk or a hazard is deemed to be important. But this does not apply to risk communication – at least from the angle of industry and environmental/consumer protection associations. The public authorities claim uniform handling and widespread use at least for their own work; but this is scarcely noticed by the representatives of industry and NGOs.

Are there any **other terms** that are used to describe the **situation of risk and hazard?** And **which terms** still lead to **understanding and communication problems** amongst the stakeholders in this communication? The terms mentioned by the respondents were classified and summarised in Table 9.

Table 9: Risk communication terms

Other terms which describe the situation of risk/hazard	Other terms that lead to understanding and communication problems
Political strategies	
• Precautionary principle, sustainability	• Consumer health protection
Terms	
• Risk (reactive, acceptable, appropriate, imposable), risk potential, risk acceptance • Danger (acute, abstract, concrete), hazard, threat • Damage (reversible, irreversible, defensible, indefensible) • Safety, protection, protective measures, maximum level, limit value, zero tolerance • Distribution benefits/costs • Residues, residue contamination: multiple residues	• Threat to health • Danger, hazard • Risk potential, risks (possible, potential) • Dangerous substances, contaminants • Harmful to health; harmful to the environment • Carcinogenic, suspected carcinogenic, mutagenic
Indicators risk research	
• TDI (Tolerable Daily Intake) • NOEL (No Observed Effect Level)	• Possible Maximum Loss

Most of the terms mentioned by experts can be roughly attributed to the theme - protection goal. There is a lack of clarity regarding a common understanding of the operationalisation of the protection goals and the specification of the level of protection (e.g. limit value). It was pointed out several times that terms which come from legal or statutory contexts of use, are very difficult to grasp for concrete questions. This applies, for instance, to different legal specifications of damage, danger, risk with their respective forms acute, abstract, irreversible etc. No differences between the three groups of stakeholders could be identified.

Risk assessment aspects: different stakeholder views

In another question the experts were asked to assess some **aspects with regard to their importance to risk assessment for the three groups of stakeholders:** public authorities, industry and NGOs. The assessment was once again undertaken using a scale of importance from 1 (not important at all) to 7 (very important). Tables 10 to 12 give a ranking of the most important and least important risk assessment aspects for the three groups of stakeholders. This involves both a self-assessment – when for instance public authorities assess the most important (least important) assessment aspects for public authorities- and also of external assessment – when for instance public authorities estimate the importance of assessment aspects for industry and NGOs.

Generally speaking two things can be observed: firstly, the assessment criteria are very different for each of the three groups of stakeholders. This indicates that risk understanding differs for each group of stakeholders. Secondly, it shows that the assessment of the most important or least important risk assessment factors is extremely coherent for the three groups. In most cases the same aspects are attributed to the individual stakeholders.

Table 10: Ranking of the most important/least important aspects of risk assessment in the case of public authorities

Ranking of the *most important* aspects	Ranking of the *least important* aspects
...from the angle of public authorities	
1. Lasting nature of exposure	1. Distribution fairness (benefit and risk)
2. Spread of danger	2. Natural nature of risk
3. Probability of damage	3. Perception of risk by those concerned
4. Scale of damage/benefits	4. Risk regulation (e.g. limit values)
…from the angle of environmental and consumer associations	
1. Risk regulation (e.g. limit values)	1. Perception of risk by those concerned
2. Spread of danger	2. Natural nature of risk
3. Probability of damage	3. Probability of benefits
4. Scale of damage/benefits	4. Personal ability to control the level of risk
…from the angle of professional associations and companies	
1. Risk regulation (e.g. limit values)	1. Distribution fairness ((benefit and risk)
2. Probability of damage	2. Probability of benefit
3. Spread of danger	3. Voluntary nature of exposure[9]
4. Lasting nature of exposure	4. Personal ability to control the level of risk

For *public authorities* the spread of danger and the probability of damage are unanimously deemed to be important assessment criteria. For public authorities themselves the lasting nature of exposure is the most important aspect of risk assessment. Interestingly, in respect of their own perception risk regulation via for instance limit values has no importance at all for public authorities – this is viewed very differently by industry and NGOs. They assume that public authorities orient their risk assessment activities first and foremost towards risk regulation. The aspects of distribution fairness or benefit and risk, perception of the risk by those concerned and natural nature of the risk do not have scarcely any impact on public authority risk assessment.

Table 11: Ranking of the most important/least important aspects of risk assessment in the case of industry

Ranking of the *most important* aspects	Ranking of the *least important* aspects
...from the angle of public authorities	
1. Probability of a benefit	1. Risk regulation (e.g. limit values)
2. Probability of damage	2. Voluntary nature of exposure
3. Lasting nature of exposure	3. Perception of risks by those concerned
4. Scale of damage/benefit	4. Natural nature of risk
…from the angle of environmental and consumer associations	
1. Probability of a benefit	1. Distribution fairness (benefit and risk)
5. Risk regulation (e.g. limit values)	2. Lasting nature of exposure
2. Probability of damage	3. Voluntary nature of exposure
3. Scale of damage/benefit	4. Natural nature of risk
…from the angle of professoinal associations and companies	
1. Probability of damage	1. Distribution fairness (benefit and risk)
2. Personal ability to control the level of a risk	2. Voluntary nature of exposure
3. Probability of a benefit	3. Natural nature of risk
4. Scale of damage/benefit	4. Perception of risk by those concerned

In the risk assessment by *professional associations and companies* the damage and benefit aspects as well as the scale of damage/benefit clearly play a major role. Whereas industry itself indicates that the personal ability to control the level of a risk is a very relevant assessment criterion, NGOs see questions of (political) regulation of risk as a decisive aspect in the

[9] If two aspects were rated the same in terms of quantity, they were given the same ranking.

risk assessment by companies and professional associations. In contrast, public authorities rate this aspect as being completely unimportant for the stakeholder group industry. Assessment criteria like distribution fairness, natural nature of the risk and voluntary nature of exposure have scarcely any impact on the risk assessment by industry.

Table 12: Ranking of the most important/least important aspects of risk assessment in the case of environmental and consumer associations

Ranking of the *most important* aspects	Ranking of the *least important* aspects
... from the angle of public authorities	
1. Lasting nature of exposure	1. Probability of a benefit
2. Perception of risk by those concerned	2. Natural nature of risk
3. Risk regulation (e.g. limit values)	3. Scale of damage/benefit
4. Voluntary nature of exposure	4. Personal ability to control level of risk
... from the angle of environmental and consumer associations	
1. Risk regulation (e.g. limit values)	1. Natural nature of risk
2. Perception of the risk by those concerned	2. Probability of a benefit
3. Spread of danger	3. Voluntary nature of exposure
4. Lasting nature of exposure	4. Personal ability to control the level of risk
…from the angle of professional associations and companies	
1. Risk regulation (e.g. limit values)	1. Probability to a benefit
2. Perception of risk by those concerned	2. Natural nature of risk
3. Lasting nature of exposure	3. Personal ability to control the level of risk
4. Distribution fairness (benefit and risk)/probability of damage/spread of danger	4. Voluntary nature of exposure

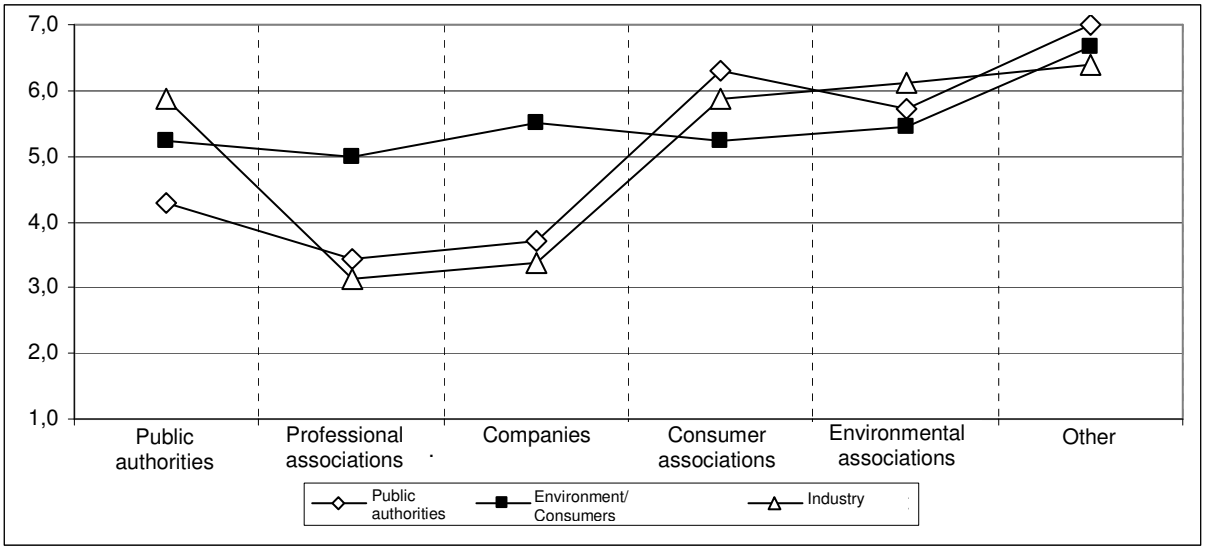
How do environmental and consumer associations see risk? They agree that the most important assessment criteria are risk regulation, perception of the risk by those concerned and the lasting nature of exposure. In the risk assessment by civil society, benefit aspects, natural nature of the risk and individual and self-imposed risk factors – like voluntary nature of exposure and personal ability to control the level of the risk - scarcely play any role at all.

Influence, motives, and competences: risk communication stakeholders

In the final theme area in the survey the experts were asked to rate risk communication stakeholders in respect of their biggest influence, main motives and competences.

When asked about who, in their opinion, exerts the greatest influence in risk communication in Germany, the respondents commented in the manner depicted in Fig. 9. Public authorities and industry show a very similar assessment pattern. They both estimate the influence of professional associations and companies as being the lowest whereas they attribute very considerable influence to consumer and environmental associations. By contrast, there are differences when it comes to assessing the influence of public authorities. Whereas industry feels that public authorities have major influence; this is rated far lower by representatives of public authorities. What is uniform in contrast is the assessment of the influence on communication by civil society stakeholders. They attribute all stakeholders a large degree of influence and there are scarcely any differences between stakeholders. All stakeholders believe that the so-called “others” have the biggest influence”. The response to this question was intentionally presented in an open manner. Additional questions revealed that they mainly thought of the media – in particular the popular media and television. In isolated cases trade unions, churches and Stiftung Warentest were mentioned. The attribution of the biggest influence in risk communication to civil society stakeholders and media reveals that risk communication is understood as communication that addresses above all publicly perceived risk topics that are dealt with in the media. Seemingly, information about crises enjoys an important position in this communication.

Fig. 9: Influence of stakeholders in risk communication



Question: In you opinion who exerts the greatest influence in risk communication?
Answer option: Scale of 1 = "no influence at all" up to 7 = "very big influence" (y axis)

What are the **key motives of public authorities, industry and NGOs** in risk communication? Table 13 sums up the motives of the individual stakeholders. The motives mentioned can be attributed to shared and personal interests. All stakeholders are attributed the motivation of wanting to protect man and his environment. Besides this, interest-driven motives also play a big role. In the case of *public authorities* they encompass establishing a profile vis a vis other public authorities, proof of action competence in the event of public protests and media pressure or the justification of political measures. In the case of *civil society stakeholders* the motives mentioned were member loyalty and attracting new members, the mobilisation of funds and a strong media orientation as personal interests. *In the case of professional associations and companies'* economic interests and the avoidance of direct and indirect economic damage (image, credibility, product sales) were centre stage.

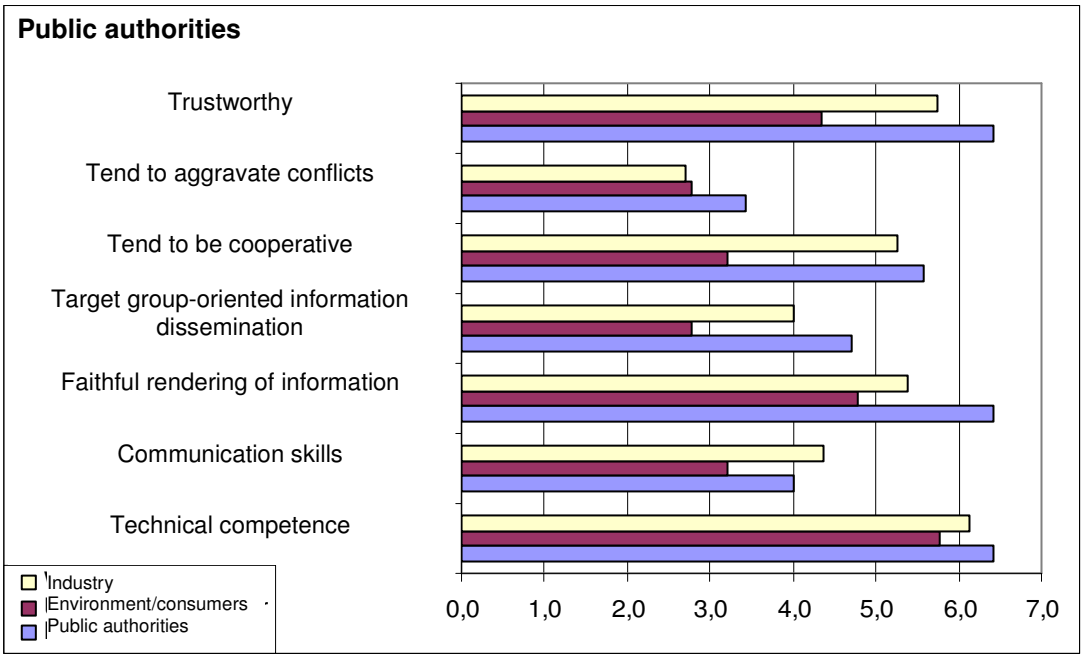
Table 13: Key motives of stakeholders in risk communication

Key motives for risk communication	
…of public authorities	
• Protection of citizens is an autonomous and statutory task of the state • Prevention of harm to citizens and economic damage to public authorities • Putting in place uniform competition conditions • Raising profile vis a vis other public authorities	• In some cases motivated by public protests and media pressure • Justification of political measures and, in some cases, major impact of political motives • Wide spectrum of motives, which can lead to completely different behaviour
…of environmental and consumer associations	
• Raising awareness and protection of consumers and the environment • Representing interests of consumers and the environment • Civic engagement, personal convictions in some cases also interest-driven	• Non-state-organisations: highly individualised and dependent on individuals with motivation in the normative area • Member loyalty and attraction, mobilisation of funds • Media aspects in some cases very strong
…of professional associations and companies	
• Economic interests with avoidance of economic damage (image, credibility, sales) • Protection of the population against risks	• Compliance with statutory rules (in most cases limited to acute risks)

Another set of questions determined the **estimation of various skills of the stakeholders.** The focus was on cooperation skills (cooperative, conflict-aggravating), communication skills (target-group orientation, correct passing on of information, communication skills) and knowledge competence (expert competence).

In the case of *public authorities* (cf. Fig 10) all respondents stressed technical competence – there is scarcely any doubt about this amongst all the stakeholders concerned. This goes hand in hand with the faithful rendering of information, something that public authorities are deemed to do by both business and civil society representatives. When it comes to trustworthiness and willingness to cooperate, the estimations of industry and NGOs differ. Whereas experts from professional associations and companies see public authorities as trustworthy and cooperative, NGOs are far more sceptical. However, public authorities are not seen as aggravating risk communication conflicts. In contrast, they respondents seem to agree that communication skills and target group-oriented information transmission do not rank amongst the core competencies of public authorities. It is also noticeable that public authorities give their competencies (with the exception of communication skills) a far higher rating than the representatives of industry and NGOs. Hence, this self-assessment achieves a (far) rating than the one given by the external assessment.

Fig. 10: Estimation of the stakeholder public authorities in risk communication

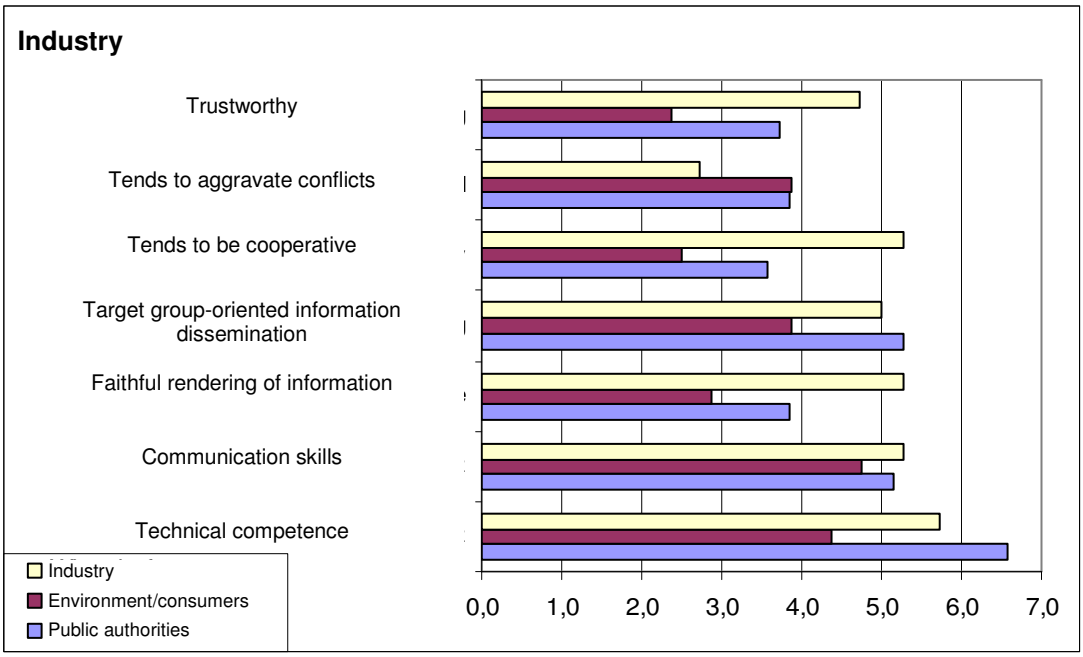


Question: How do you rank the stakeholder "public authorities" in the field of risk communication regarding the following aspects?
Answer options: Scale of 1 = "does not apply at all" up to 7 = "completely applies (x axis)

Professional associations and companies (cf. Fig. 11) give the technical competence of public authority representatives a high rating. They seemingly appreciate the technical competence and expertise of companies and associations. NGOs are far more reticent in their assessment. By contrast, they do agree that communication and the target group-oriented dissemination of information are one of industry's strengths even if, once again, the NGOs are far more sceptical. Industry representatives vehemently claim that they are capable of rendering information faithfully. Public authorities and NGOs are far less certain. They clearly appreciate the expertise of industry but believe there is major scope for improvement when it comes to the faithful rendering of information. Willingness to cooperate is only deemed to be very high in industry's own assessment of itself; public authorities and NGOs scarcely take any note of this. Quite the contrary: according to their estimation professional associations

and companies tend to aggravate conflicts and enjoy low (NGOs) to average (public authorities) trustworthiness.

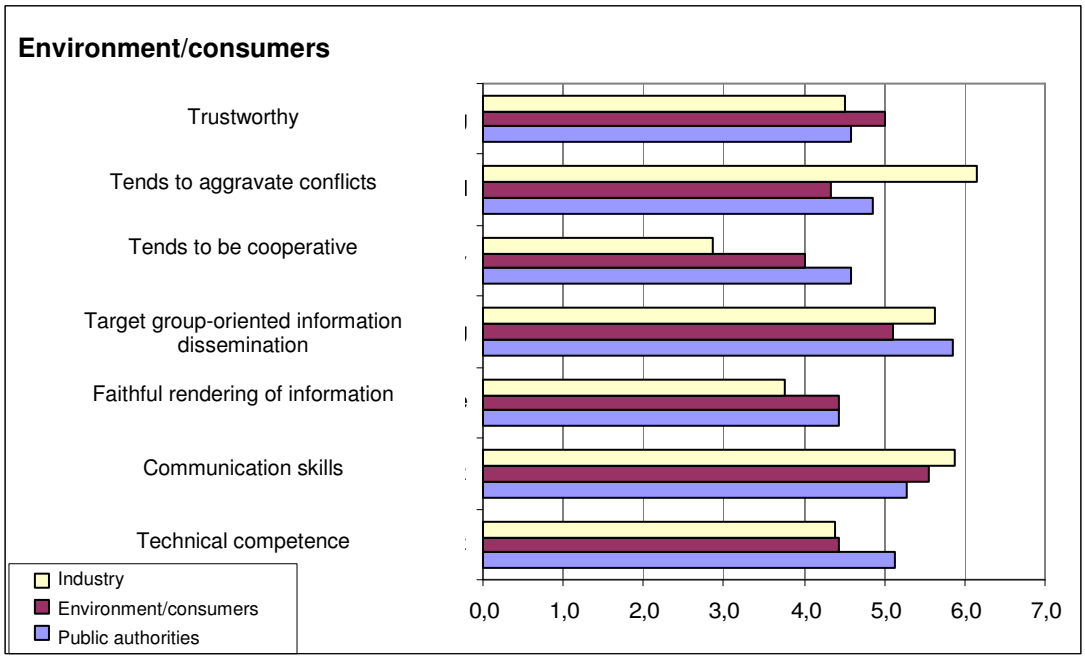
Fig. 11: Estimation of the stakeholder industry in risk communication



Question: How do you rank the stakeholder "professional associations and industry" in the field of risk communication regarding the following aspects?
Answer options: Scale of 1 = "does not apply at all" up to 7 = "completely applies (x axis)

All stakeholders rate the technical competence of *environmental and consumer associations* (cf. Fig. 12) lower than that of public authorities and industry even if public authority representatives perceive slightly higher technical competence. NGOs have major strengths when it comes to target group-oriented information dissemination and communication skills. This opinion is shared by industry and public authorities. When it comes to cooperation behaviour, industry in particular sees a clear conflict strategy by NGOs whilst they themselves scarcely behave in a cooperative manner. Public authorities and NGOs themselves generally see only marginal differences here. It is worth noting that in the self-assessment, NGOs are far more critical of their competences; for no aspect did they rank themselves higher than the external assessment by public authorities and industry – this was different in the case of the self-assessments of public authorities and industry.

Fig. 12: Assessment of the stakeholder environmental and consumer associations in risk communication



Question: How do you rank the stakeholder "consumer and environmental associations" in the field of risk communication regarding the following aspects?
Answer options: Scale of 1 = "does not apply at all" up to 7 = "completely applies (x axis)

4.1.3 Importance and practice of risk communication

Successful procedures in the field of risk communication
This theme block consists of responses to the open question concerning the **procedure** in Germany that so far has been successful in the field of risk communication and which **practice** has proved its worth.

ORIGINAL SOUND PUBLIC AUTHORITY
"Risk communication can only be successful if it is open and transparent".

In the **general comments** *the public authority representatives* mentioned as the fundamental principles of successful risk communication: openness, transparency and timeliness. At the same time, attention was drawn to a credibility deficit amongst public authorities: ministries and downstream public authorities had difficulties in convincing the public at large that there was no risk when environmental and consumer associations were communicating the exact opposite message. This was because these associations enjoyed higher credibility than the public authorities in the eyes of the population at large. In order to refute the opinion of associations, hard data would have to be presented. In this context one public authority representative noted that a convincing argument was "when for instance [through blood samples] concrete evidence could be furnished that human exposure [to dioxins, PCBs and heavy metals] had fallen considerably over the last 10-20 years."

The representatives of *industry* also indicated that risk communication could only be successful if it was transparent, correct and consistent. At the same time, they stressed their considerable credibility problem amongst the population at large which was even greater than that of public authorities.

The *environmental and consumer associations* noted a general improvement in risk communication particularly in the case of product risks. The main reason for this was the awareness

of the population at large since no supplier could afford to be the subject of ongoing public criticism for specific products. It is noted that risk communication overall was very much media-driven and that the public authorities tended to react more to topics picked up the media than to engage in proactive communication.

The *public authorities* mentioned as instruments of successful risk communication the establishment of regular warning systems that are intelligible to and accepted by consumers, cooperation between various stakeholders in bodies, press releases, Internet websites or scientific publications. From the angle of industry statutory regulations like provisions and guidance values are tried-and-tested instruments. Environmental and consumer associations list the transparent communication of knowledge and public discussion of topics as the main instruments.

On the subject of **food** the *public authorities* mentioned acrylamide (attention peak in 2002/2003) as an example of successful risk communication. It shows how even in the case of a risk assessment that had not been definitively elucidated on the scientific level, through cooperation between if possible all stakeholders, good solutions could be developed for the protection of the population by getting an if possible broad spectrum of stakeholders like manufacturers, consumer associations, associations of chefs, German Hotel and Restaurant Association to engage in joint, consistent actions. The state played the role of a mediator. Furthermore, in the opinion of public authorities communication on coumarin in cinnamon was successful. In the field of food, state regulation and control were mentioned as tried-and-tested instruments.

Industry representatives also mentioned acrylamide several times as an example of success. BfR is identified as the key player. In this case its highly transparent procedure had served as a model; the joint official version is stressed as a contributory factor to success. Furthermore, the good communication in the case of *Salmonella* and aflatoxins is underlined. The public authorities provided consumer information and, at the same time, engaged in a dialogue with industry in order to generate process changes and to eliminate any risk sources. The instruments listed are statutory regulations and the voluntary or mandatory labelling of composition, shelf life or other product characteristics.

ORIGINAL SOUND INDUSTRY
"Acrylamide is an ongoing topic but the scandal effect now seems to have been avoided through impartial reporting"

ORIGINAL SOUND NGO
"*Communication worked very well in the case of avian flu."*

Communication of the acrylamide risk was also deemed to be successful by *environmental and consumer associations.* Furthermore, information from the ministry about dioxin in eggs had also been effective around two years ago. One respondent likewise classified communication on the topics GMOs and BSE as successful. The subject avian flu was quoted as an example of successful risk communication, too. Here, the excellent interaction between political circles and science was underpinned. One important communication instrument that had been used was a troubleshooting team in the ministry with representatives of all the stakeholders. They had been involved in a close and sustainable manner in legislation. Nonetheless, communication for consumers in the case of avian flu was deemed to be inadequate. One respondent suggested to BfR that it should conduct the evaluation of its communication on the consumer side by means of surveys. Health information on food, so called health claims were mentioned as a tried-and tested instrument of risk communication for food.

The *public authority* examples of successful risk communication on the topic **chemicals** included the example given of dioxin in copper slag and furthermore the establishment of a warning system for the Rhine riparian states in the event of contamination of the Rhine. When an incident occurred, a regulated process would ensure the timely provision of the

relevant information together with behaviour instructions for the population at large. The core of the warning system was a "regular exchange of information with clearly named contact persons and corresponding regulated mechanisms which then also organise communication right down to the public at large". In the field of chemicals voluntary undertakings alone were not sufficient in the opinion of the public authorities. Here pressure was needed which would have to be generated through regulatory measures.

On the *industry side* the mandatory labelling of chemicals imposed by the European Legislation (REACH) or by the international Globally Harmonised System (GHS) met in principle with acceptance. It promoted transparency, the importance of which was underlined once again. *Environmental and consumer associations* see the ban on CFCs as the result of successful risk communication.

For the topic **radiation** a positive example was not offered by *any of the stakeholders.* One *industry* respondent indicated by way of example, "radiation is still used politically as a bogeyman" Here a link was intentionally established between radioactive rays and electromagnetic mobile phone rays.

The above response material reveals that it was difficult for the respondents to actually indicate more comprehensive procedures by means of which success had been achieved in the area of risk communication. Often the answers relied on individual keywords or fragmented statements – the mention of topics, measures – without explaining the examples of success in any detail, placing them in a larger context or indicating the demands. Despite "ready-made solutions" being mentioned again and again like transparency, openness, and credibility, these success criteria seem to be largely unfamiliar territory for the stakeholders in the communication process.

Involvement of stakeholders in risk communication and forms of involvement
This section considers various aspects of stakeholder involvement in risk communication; the data for this were collected from the responses in the expert interviews to several questions:

- The respondents were to discuss in more detail **concrete cooperation** with the other groups of stakeholders.
- Public authority representatives were asked about the current **practice of involving** environmental and consumer associations and industry in the communication process, about special procedures for involvement and about the right point in time. The representatives of environmental and consumer associations industry, in turn, were asked about their **wishes** concerning the timing and the nature of their involvement in the communication process.
- All stakeholders were supposed to assess various **forms of participation** discussed in the scientific literature and make proposals on how to structure them in an effective manner.

The interviews revealed that the public authorities cooperate with representatives of industry and environmental and consumer associations in various ways on risk communication and assessment. This **cooperation,** however, only rarely assumes a regular or institutionalised form. In most cases it is oriented towards acute problems and is organised in an ad hoc manner by public authorities in a problem/project-driven manner.

ORIGINAL SOUND INDUSTRY
"There are regular contacts and talks about problems with public authorities – not in an institutionalised manner but in a project or problem-driven manner."

According to *responses from public authorities,* there is **institutionalised cooperation** in lower Saxony between industry representatives, consumer associations and public authority representatives who have set up an advisory council for consumer protection. There was also organised involvement of industry in the area of medicinal product safety where a rapid exchange of information was ensured in this way on both hazards and risks. Another systematic procedure mentioned is the cooperation concerning the notification of infectious diseases. The respondents from public authorities reported various formalised contacts between public authorities and (professional) associations; for instance there were annual meetings with the Industrial Gas Association and the Association of the Pyrotechnical Industry. Through joint work in expert bodies, standardisation bodies, technical bodies like the technical-scientific associations (e.g. DECHEMA – Society for Chemical Engineering and Biotechnology), advisory bodies like for instance the Commission on Plant Safety, which advises the Federal Government or technical-scientific conferences, there were regular meetings and an ongoing exchange between industry, science and public authorities. At the same time, there was coordinated cooperation between public authorities and industry on the execution of their state tasks of testing, analysis and marketing authorisation of substances or products. The cooperation between public authorities and industry by means of formalised contacts and on product approval is also confirmed by *industry*. Although representatives of the *environmental and consumer associations* stress the, in some cases, good cooperation with public authorities, the overall impression from the responses is that there is a major difference on the one hand between public authorities and industry and on the other between representatives of environmental and consumer associations. This is described by one representative of environmental and consumer associations as the feeling of not always being involved on a par level by public authorities with industry or not being given the same privileged access to their study results. Another representative indicated that there is practically no cooperation with public authorities as they did not draw on the know-how of civil society but merely engaged in one-way communication.

In the majority of cases cooperation is **event-driven**. The representatives of public authorities mentioned the following examples:

- Cooperation on coumarin,
- Preparations for a potential influenza pandemic,
- Cooperation on fragrances in detergents and cleaning agents as the potential triggers of the Multiple Chemical Sensitivity (MCS) syndrome,
- Dialogue process with stakeholders on nanotechnology.

ORIGINAL SOUND NGO
"*In future it would be important to develop information systems which disseminate information in a more targeted and widespread manner.*"

In the meantime *environmental and consumer associations* or *industry* also take the initiative on cooperation. For instance Stiftung Warentest indicates that for each of its studies it convenes a technical advisory body in which there are also representatives of public authorities. Furthermore, Warentest cooperated closely with offices of weights and measures and with the environmental label Blauer Engel by providing study results for the generation of award documentation. The Electrosmog Forum and the Washing Forum launched by IKW are further examples of cooperation with environmental and consumer associations.

ORIGINAL SOUND PUBLIC AUTHORITY
"Stakeholders must be involved as early as possible in the process of normal risk assessment. This must likewise be the case in crisis situations."

In response to the question directed specifically at the *public authority representatives* about **special procedures** for the improved involvement of stakeholders in the risk communication process, they mentioned: round tables, Advisory council for consumer protection, regular procedures in the field of medicinal product safety, notification of infectious diseases, dialogue process for nanotechnology, bodies, expert meetings, scientific events. Overall, *public authority representatives* are of the opinion that the involvement of industry and civil society is, in principle, necessary and that this should happen **early on** in order to

have as comprehensive design options as possible. Important goals here are the exchange of information, the clarification of responsibilities and the laying down of a joint communication strategy. One public authority representative is of the opinion that industry should be involved when a hazard is identified and consumers should be informed when a risk is identified. However, the question about when consumer associations should be integrated into the communication process is still open.

ORIGINAL SOUND NGO
"It would be advantageous for this involvement to be as early on and as transparent as possible."

In response to the question directed at the representatives of industry and of environmental and consumer associations concerning **the way in which** they could envisage becoming more involved in the communication process with public authorities and **at what point in time** this integration should take place, the respondents stressed their desire for comprehensive, timely involvement. According to the *environmental and consumer associations* the procedure in the case of nanotechnology had a model character; the wish is expressed that a similar procedure be adopted in other areas. They criticised the fact that so far the flow of data from the public authorities was not automatic but merely in response to an inquiry. What was desirable here was an active information policy by the public authorities (duty to provide). At the same time, criticism is levied in Germany at the overly wide interpretation of the confidentiality of industrial information by companies in cases where people could be endangered because of internal company incidents or products placed on the market. The demand is put forward that BfR should always involve consumer organisations, too, in its exchange with industry. In the opinion of the environmental and consumer associations, this involvement could take the form of discussion rounds, hearings, expert opinions of public authorities, discussions, telephone calls, newsletters, open and transparent bodies, round tables as well as freely accessible databases.

ORIGINAL SOUND INDUSTRY
"Industry must be involved in risk communication from the very outset and even seek out communication with the consumers. There are no ifs and buts."

The representatives of *industry* likewise express the desire for a transparent procedure by public authorities. They ask to be involved in a timely manner. When BfR does an assessment, the sector concerned should be informed to ensure that there were no "surprise reports". Even if BfR was not allowed to use any industrial or sector data for the concrete conducting of the risk assessment in order to guarantee scientific independence, industry could indeed, in some cases, supply data for example about exposure assessment. Other representatives of industry stated that they would like to be involved in the formulation of communication texts and communication strategies. Industry also mentioned the timely dialogue on nanotechnology as a positive example and suggested using this procedure as a model for other areas, too. When a problem occurred, where industry could contribute to its assessment and solution, then it should be consulted. What was important for the success of risk communication was to find a "common language" that all the stakeholders would adopt. The request was also voiced for environmental consumer associations not to be excluded; all the same they played a greater role in concrete risk communication to citizens whereas they did not have the necessary expertise for expert discussions. Furthermore, the argument is advanced that they should not be given any access to confidential corporate data communicated in these discussions. Here again the distance and mutual distrust between industry and civil society becomes clear. According to industry, they could be involved for instance through networks, emails, memos, regular working and discussion groups.

The *public authority representatives* are divided about the question whether the identification of a hazard and the identification of a risk trigger **a need for different actions.** Whereas they agree there is indeed a need for different action, along the lines that this was not necessarily as urgent in the case of a hazard as it was in the case of an actual risk or that where there was no exposure there was no need for counter-measures, the others do not see any need for specific action. One interview partner argues in the following way and touches on the

problem of the social acceptability of risks, “If, after looking at a risk, I come to the conclusion that it was acceptable, then I don’t need to do anything. And hence there is no separation.”

A difference in the identification of a hazard and a risk is only partially made by *environmental and consumer associations,* particularly as this distinction could not be communicated in a comprehensible manner to consumers. Involvement should take place at the latest when a risk is identified. Already when a hazard was identified it made sense for them to be involved in order to position the topic together with public authorities and, when appropriate, with industry and to develop effective avoidance strategies based on the available knowledge and experience collected. Once a risk had been identified, there was a need for a rapid decision. It was, however, conceded that where there was a low level of hazard, there was no need for the public authorities to provide information in every single case.

One representative of the *professional associations* indicated that there was no need for different action when it comes to identifying a hazard and identifying a risk. Furthermore, no information is available on this question in the response material from the industry representatives interviewed.

In the scientific literature on risk communication, different forms of **participation** are discussed. The three central forms were read out to the respondents, linked to the question about which forms were suitable and how they could be shaped in an efficient manner:

- Participation for the purpose of clarifying situations
- Participation for the purpose of involving the citizens concerned
- Participation for the purpose of balancing interests or a fairer distribution of costs and benefits

The *representatives of public authorities* stress that all three forms of participation were used and that overall they were both necessary and suitable. Which participation form was used depended on the individual situation. The fundamental relevance of all three forms of participation was also stressed by *industry* and *environmental and consumer associations*. The later call, in isolated cases, for the clear extension of participation in Germany along the lines of a new “participation culture”.

ORIGINAL SOUND PUBLIC AUTHORITY
“*It is certainly true that none of these forms is expendable.”*

Participation for the purpose of clarifying situations is deemed to be essential by *public authorities* in the context of risk communication. It was used in particular in the case of uncertainties in science, for instance concerning the probability of a specific occurrence of damage and the scale of damage; the key partner here was often industry which should help to clarify the situation by the unreserved supply of data and other forms of cooperation. The bodies involved were expert public authorities and scientific institutes, both on the national and international levels. The representatives of *industry* believe that companies and professional associations have a responsibility and contribution to make above all when it comes to clarifying risk-relevant situations that effect their production methods or products. For instance, the German Federation for Food Law and Food Science (BLL) could draw on its own data to help assess the exposure of specific groups in the population to specific foods. One industry representative calls for civic society to be involved, too, on a case-by-case basis in the clarification of the individual incidents but rejected a general involvement. *Environmental and consumer associations* see their role as introducing the consumer point of view. They call firstly for a participation in discussions and in the search for solutions and secondly for open access to the incidents dealt with in the procedure to establish the relevant facts.

ORIGINAL SOUND NGO
"All forms of participation are important, particularly the involvement of the people affected."

Participation for the purpose of involving the citizens concerned is part of the obligation for transparent information for the population in the opinion of the *public authorities*. This was done in particular on the *Land* or municipal levels. In the case of a regionally contained risk, the citizens affected would be directly contacted. For instance the worried parents whose children attended a school where polychlorinated biphenyls (PCBs) had been detected. This involvement took place for instance via bodies, press releases, press conferences and websites. The representatives of *industry* and *environmental and consumer associations* also recognise the importance of these forms of participation without justifying their stance with more precise details. The latter mention consumer conferences, panels and surveys with feedback as tried-and-tested instruments.

Participation for the purpose of balancing interests or a fairer distribution of costs and benefits scarcely plays a role at all according to the *public authorities* in the case of environmental protection and direct consumer protection. As, in this case, the damaged party and the beneficiary are normally clearly separated from one another. "The person who suffers the damage does not normally have any benefit at all." That's why the balancing of interests is used so widely in the field of occupational health and safety where a specific residual risk was rewarded in the case of dangerous work with special remuneration. The body responsible for balancing interests here was the Committee for Hazardous Substances (AGS) in which the trade unions and employers' associations are the most influential stakeholders. A representative of the insurance *industry* stressed the explicit relevance of the cost-benefit distribution; insurance companies were of course experts in this kind of situation. A representative of the *environmental and consumer associations* describes this form of participation as very interesting as consumers are not always victims but were sometimes also the people who caused damage and had to assume responsibility for this.

The response material shows that each of the three forms of participation has its specific area of use. The form used most frequently is involvement for the clarification of situations. This is slightly surprising as clarification of this kind is fundamental and, as a rule, must precede the two other forms of participation. Nonetheless, the involvement of the citizens concerned can still be increased further, something that is stressed and requested above all by environmental and consumer associations. Participation for the purpose of balancing interests is generally restricted to the field of occupational health and safety. It is not very likely that this form of participation could be used more in other areas particularly as in Germany financial compensation for the risk of damage to health is deemed to be unethical. In practice, this principle is however frequently used even if it is somewhat masked. For instance companies whose production involves the use of dangerous substances need scarcely fear any opposition from residents in the event of an incident when most of them are on the company payroll.

4.1.4 Challenges facing risk communication

Central problems of risk communication

The experts were asked what were in their opinion the **main problems** of risk communication in Germany and what were the actual **understanding and communication problems** between the stakeholders involved in the communication process. Furthermore, they were asked in a closed question to assess the problems identified as relevant in the risk discussions.

The **problems** identified by the respondents in the risk communication process can be broken down into the following categories:

- **Lack of systematics and transparency:** the demand for more systematics and transparency in risk communication is frequently made by the respondents. In particular the representatives of public authorities and environmental and consumer associations demand the replacement of what is frequently only crisis-driven communication with systematic, ongoing communication. This could ensure the regular, timely involvement of the relevant stakeholders in a specific risk topic. They also ask for as transparent a procedure as possible in risk assessment and communication by these two groups of stakeholders. The public authorities firstly recognise a lack of transparency as the reason for their own credibility deficit amongst citizens. Furthermore, one public authority representative encourages industry to support greater transparency and openness vis a vis consumers; this was not being done because of short-term economic considerations. Environmental and consumer associations wished to see as comprehensive as possible a disclosure of risk-relevant information. They call, for instance, for a narrower definition of the confidentiality of company information because this currently led to the non-disclosure of a wealth of important information. One representative of environmental and consumer associations sees "a lack of transparency on all levels" and adds that consumers - because of their limited access to information - were not equal market participants right now. In the responses from industry representatives the terms transparency and systematic scarcely played any role at all in the communication process.

  ORIGINAL SOUND PUBLIC AUTHORITY
  "I think we should achieve a situation in which we have transparent risk communication outside of incidents."

- **Communication with citizens**: all groups of stakeholders see communication with the population as a special challenge. It was, in principle, very difficult to communicate complex facts in such a way that they would be comprehensible to citizens. One public authority representative talks here about a balancing act between comprehensive information and intelligibility. The use of scientific language when describing hazards and risks frequently led to risk communication not achieving its goal for the public at large. One industry representative mentioned the difficulty of putting across complex facts in the context of the increasing medialisation of society. When communicating with the population at large one should always bear their capacities and motivation in mind; risk communication would, therefore, have to be oriented towards target groups.

- **Risk perception:** the respondents all perceived the risk perception of the population at large as a problem for the successful communication of risks and hazards. According to one public authority representative, the risks to which citizens willingly expose themselves that were linked to a subjective benefit tended to be underestimated whereas external risks, with which the potential damaged party did not associate any benefit, were overestimated. "Whenever people do not see any benefit, they do not accept any risk either. I don't need to bother giving them any figures; I can forget that right away." Industry representatives indicate that the prevailing expectation of a zero risk amongst the population was far removed from reality. They add that the term "risk" itself already had negative connotations. One representative of environmental and consumer associations talks about a very unclear perception of risks amongst the general public. Risks were perceived in a highly emotional and irrational manner. The more emotional the perception of a specific risk, the more difficult it was to communicate it.

- **Different interests:** All three groups of stakeholders recognise the different interests as the cause for risk communication problems. On the public authority side these different interests are described on the one hand as the core problem; on the other it is stressed that there would be no problem if people were sufficiently aware of this reality. In particular the communication between industry and public authorities was not problematic as the respective interests, attitudes and action motives were transparent. Representatives of environmental and consumer associations criticised the fact that industry had the goal in all of

its activities of keeping its economic risks as low as possible. One industry representative pointed to the very different assessments of hazards and risks by public authorities on the one hand and environmental and consumer associations on the other.

ORIGINAL SOUND INDUSTRY
"We have interested but completely uninformed consumers, media interested in scandals and politicians seeking to raise their profile."

- **Instrumentalisation:** The public authorities criticised the ideologisation of the risk discussion as this hampered understanding based on rational arguments. Environmental and consumer associations talk about "entrenched fronts" in the case of specific risk topics. One respondent criticised the mutual scepticism to be found amongst environmental and consumer associations and public authorities although they pursued similar goals. Industry representatives repeatedly referred to the political instrumentalisation of the risk discussion. They also touched on the problem of competition amongst the mass media and the resulting "snowball effect" of the risk topics covered in the media. A topic was either not covered at all by the media or it was taken up and exaggerated – there was nothing in between these two extremes.
- **Definitions:** According to all the stakeholder groups, the use of different vocabulary and non-uniform terms is a major problem in the risk communication process. One representative of public authorities distinguishes in the first place between stakeholder groups involved in the communication process and citizens who attribute different meaning to the terms "risk" or "safety". Representatives of the environmental and consumer associations commented that there were deviating understandings of terms amongst associations and public authorities in the field of health hazards whereas the public authorities often only saw the acute hazard; long-term hazards were ignored. Industry, too sees, misunderstandings caused by misinterpretations of concepts as a risk communication problem that has to be solved.

Furthermore, the respondents mention various **concrete risks and risk areas** in which there are risk communication problems at the present time. Representatives of the *public authorities* mention medicinal product safety, infectious diseases, imported toys, cosmetics, chemicals, tar oils, rotten meat, food, noise, air pollutants and leisure risks. *Environmental and consumer associations* mention radiation, chemicals, toys, avian flu, food monitoring, food residues, food quality, food hygiene, genetic engineering, food supplements and alcopops. The *industry* group of stakeholders see problems with food, preservatives, chemicals, pesticides, coumarin, acrylamide, radiation, genetic engineering, rotten meat and fine dust.

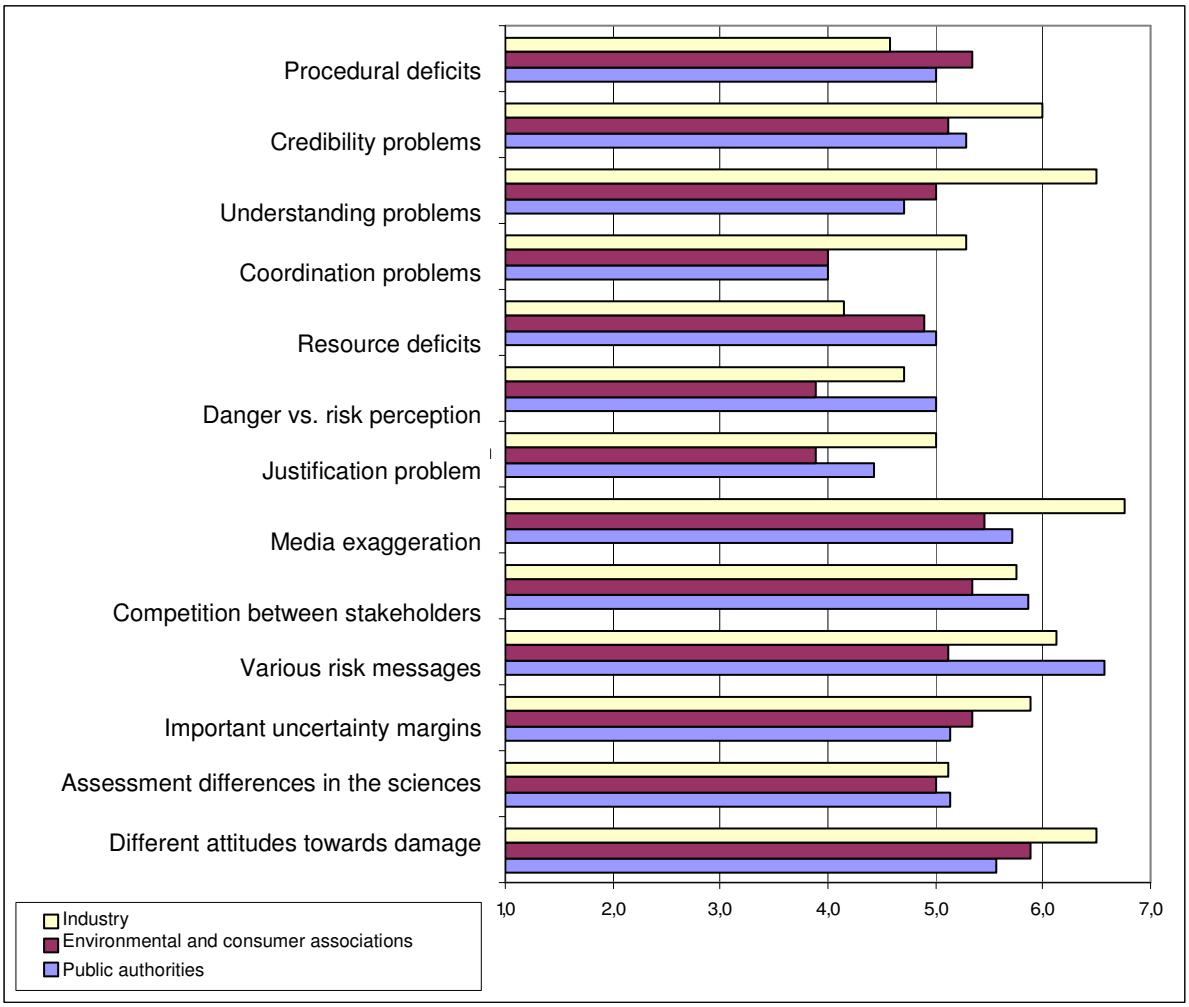
How do the experts assess the **relevance** of the problems of risk communication identified as central in the risk discussion? In conjunction with this question the experts were asked to assess 13 **problems.**

Fig.13 presents the results of this assessment broken down for the three groups of stakeholders. The figure shows that all the problems mentioned were deemed to be at least moderately relevant by all stakeholder groups. The middle of the scale (value 4) is only marginally undercut in two cases. Industry representatives gave the highest values overall for the problem estimation followed by public authorities and environmental and consumer associations. For several aspects the relevance attributed by industry deviates considerably from the general picture, i.e. for problems of understanding, coordination and media exaggeration

Overall, only moderate importance is attributed to the legitimisation problems, danger vs. risk respective, resource deficit and coordination problems. Industry representatives attribute greater importance to the latter than the other stakeholder groups. The respondents see slightly more relevance for procedural deficits and assessment differences in science. Whereas for the latter aspects the estimations of the stakeholders groups correspond, procedural deficits are stressed above all by environmental and consumer associations and by

public authorities. The competition between stakeholders, major uncertainty margins, problems of comprehension and credibility issues are seen as relevant problems of risk communication. The last three are identified in particular by industry representatives as challenges. What is particularly noticeable is the higher stressing of the aspects credibility and understanding by industry compared with the other groups of stakeholders. The highest values are achieved by media exaggeration, various risk messages and different attitudes towards damage. Negative effects in the risk communication process caused by media exaggeration is an opinion that is generally shared by industry representatives; the assessment by industry is far clearer than that of the public authorities or of environmental and consumer associations. Furthermore, industry attributes greater relevance to the different attitudes towards damage than the other stakeholder groups. Environmental and consumer associations only agree to a moderate degree with the fact that various risk messages can lead to risk communication problems whereas industry and above all public authorities attribute great relevance to this aspect.

Fig. 13: Estimation of the central problems of risk communication



Question: I am going to list some aspects that are discussed as central problems of risk communication. Please assess their problem relevance.

Answer options: Scale from 1 = “not relevant at all” up to 7 = “very relevant (x axis)

Ways of optimising risk communication
This theme complex deals with recommendations, proposals and ideas for improved risk communication. The experts were asked how **communication problems** could be **avoided,** in future, in risk communication. They were asked to structure their answers using the dimensions "institutional shape", "new procedures" and "new instruments". Furthermore, they were asked to give **positive examples** of risk communication from **abroad** and the contributory factors to their success. At the end of the interview they were asked to formulate "**homework**" for the three groups of stakeholders in order to achieve progress in risk communication.

In the case of their **general comments** in response to the question about how communication problems could be avoided, the *stakeholder groups* all equally stressed the key importance of transparency, open communication and the timely involvement of those concerned. According to information from the *public authorities,* this encompasses the establishment of a uniform level of knowledge, clarification of definitions and the transparent, plausible listing of risk assessments and management measures. One public authority representative mentions the MAC Commission (maximum workplace concentration) as the example of a tried-and-tested institution which enjoyed high credibility also in conjunction with controversial discussions amongst industry and amongst environmental and consumer associations. The decisive factors here were its organisational independence and the high technical qualifications of its staff. The *environmental and consumer associations*, like the public authorities, point to the need for upstream discussions about the definitions which were to serve as the base for understanding. *Industry* calls for more transparency in drawing up the expert reports; there shouldn't be any "surprise reports". Furthermore, the courage to clearly admit dissent was important.

*Concerning **institutional structure,** public authority representatives* point out that communication forms (round tables, telephone conferences), which had only been used so far for specific incidents, would have to be institutionalised in the future; this meant that corresponding financial and personnel resources would be needed. One public authority representative is of the opinion that, with the establishment of BfR as an independent federal institution for risk assessment, a decisive step had already been taken and lessons learned from the mismanagement of the BSE scandal. Furthermore, independent agencies were now being established on the European level like the European Food Safety Agency (EFSA) or, in future, an independent chemicals agency. *Environmental and consumer associations* also wish to see the institutionalisation of existing risk communication procedures. Troubleshooting teams should be set up, existing institutions should be given more funds. Furthermore, one respondent calls for greater independence for public authorities. Some of the *industry* representatives believe, as do the two other groups of stakeholders, that a formalisation of procedures would make sense. They suggested the creation of institutionalised theme-specific networks and the setting up of a risk council. The main tenor of the industry representatives is, however, that the current institutional structure is sufficient.

ORIGINAL SOUND INDUSTRY
"Evaluating institutions like UBA or BfR must compile the information better and present it in a joint database."

ORIGINAL SOUND PUBLIC AUTHORITIES
"In the case of the BSE scandal it was impossible for the population at large to determine whether the fact that meat was still being placed on the market was because the meat was safe or because, otherwise, the economic damage would have been too great."

The *public authorities* mention quantitative risk analysis and the greater involvement of industry as proposals for **new procedures**. Quantitative risk analysis, which was already used in the UK and Holland, helps to create transparency and trust. The core idea was the establishment of a social consensus concerning an acceptable value for specific risks. In order to avoid repeat studies and discussions based on different levels of knowledge, industry would have to be obliged - according to the public authorities - to itself generate data and make

them available. *Industry representatives* stress the need for improved coordination amongst the public authorities, in particular between the federal *Länder* and the federal level.

All stakeholder groups mention more comprehensive use of the media and database as examples of **new instruments** in risk communication. The Internet, web blogs and well-maintained databases with an intelligible presentation of the facts were instruments that should be used more. This would mean that target groups that had not been reached so far could be reached.

In response to the question about **positive examples** of successful risk communication **from abroad**, the countries Denmark, Sweden (Scandinavia), the Netherlands, England and Switzerland were mentioned. Furthermore, risk communication was gaining recognition in the European Union.

ORIGINAL SOUND INDUSTRY
"In other countries the discussion culture between social stakeholders is less conflict-driven than in Germany."

The public authorities and environmental and consumer associations praised the Food Standard Agency (FSA) in the United Kingdom for involving all the stakeholders and for not being afraid to mention the names of manufacturers of risky products. In principle there were very open, participatory dialogue structures in Scandinavia. When it came to the development of test methods, for instance, a national participatory process was first established and then coordinated with other Scandinavian countries and Europe. Another positive example mentioned by the public authorities is quantitative risk analysis in Switzerland. It was accepted by all stakeholders in that country and facilitated, in the event of a problem, a decision about the acceptability of the risk. On the European level the founding of the European Human Biomonitoring Network is mentioned. One of the main goals of the expert team ESBIO (Expert Team to support Biomonitoring in Europe) established within this framework is the communication of work undertaken. One representative of *environmental and consumer associations* describes the Danish "smiley" as an example of good practice. This symbol renders the results of the tests of state food examiners of companies in the food sectors transparent for customers. *Industry* makes a positive reference to the United States: firstly to the US EPA database, secondly to the proactive information policy of American energy companies in the case of the emerging EMF debate. Furthermore, Sweden's "Vision Zero" is mentioned. In this context Sweden aimed to reduce the number of traffic fatalities to zero.

The question about "homework" for the three groups of stakeholder was the last point in the guide for the expert discussions. For the **public authorities** the following areas were identified as in need of improvement:

- **Communication style:** In the opinion of the *public authority representatives* a greater target group orientation in risk communication was desirable. Firstly, the core message should be transported in simple, intelligible language; secondly interested citizens should be provided with more extensive, more complex information on the respective risk theme. Furthermore, there was a need for greater transparency particularly regarding the reasons for risk management measures. *Environmental and consumer associations* see a duty of public authorities to provide relevant information. Public authorities should do this through active communication management for instance via newsletters and Internet portals. *Industry* would like public authorities to engage in timely communication with the people affected and the stakeholders, and to show a willingness to actively adopt a position vis a vis the public at large on controversial topics.
- **Internal public authority structuring:** Public authorities wish to see more comprehensive in-house, interdisciplinary cooperation. Furthermore, risk communication should be seen as an overarching task by all staff. Moreover, the necessary financial and qualified personnel resources should be made available for the communication task. Representa-

tives of *environmental* and *consumer associations and industry* suggest the optimisation of the communication strategies of public authorities; in particular their internal coordination was in need of improvement. When crises happen, they want clear instructions from ministries.

The **environmental and consumer associations** were presented with these points:

- **Communication style:** The *public authorities* wished to see more factual information from environmental and consumer associations and a more rational handling of arguments by public authorities and industry. In the opinion of one public authority representative, they should not view risks one-sidedly but also include for instance economic aspects in the risk assessment. The *environmental and consumer associations* demand that they themselves work with scientifically validated data and respect the rule of proportionality in their demands for risk management measures. *Industry* takes up and stresses the demand expressed by public authorities for more factual information. Environmental and consumer associations should engage in risk assessment in line with the facts without seeking to mobilise donations and members, refer to the scientific facts and refrain from blowing risk topics up into scandals.
- **Cooperation:** The representatives of *public authorities* and *industry* call for more cooperation between environmental and consumer associations and public authorities and industry. The *environmental and consumer associations* see for themselves above all a need for improved networking and cooperation within the association landscape. Expertise should be bundled and expert networks and activities coordinated between various associations.
- **Skill building:** In the opinion of *public authorities* and *industry,* environmental and consumer associations should endeavour to increase their technical know-how. Furthermore, according to the public authorities they should introduce mechanisms for the quality assurance of information. Representatives of *environmental and consumer associations* recognise the importance and need to develop the competences of their staff members. By means of internal organisational bundling, communication skills could be strengthened.

The following suggestions for improvements were made in the case of **companies and professional associations**:

- **Communication style:** *Public authority representatives* wish industry to show greater openness and transparency regarding the hazards and risks arising from products or production methods. Consumer concerns should be taken over to a greater degree in the risk communication of industry and the dissemination of information should be more target group-oriented. *Environmental and consumer associations* call, similar to public authorities, for the establishment of transparency and a greater willingness to cooperate in discussions. The ecological and social impact of risks should be taken into account alongside economic effects. The *industry* representatives themselves point to the major relevance of the faithful rendering of information. Communication should be undertaken with greater openness. Instead of pursuing a strategy of shutting down the hatches, industry should from the very beginning engage in a dialogue with other stakeholders and the public at large.
- **Cooperation:** Industry is called on by *public authorities* to be more open earlier on and involve other stakeholders like public authorities and environmental and consumer associations in their communication process. *Environmental and consumer associations* point to the important function of industry as a source of data and information. Industry should be more cooperative and place greater weight on precautionary risk activities. *Industry* representatives also recognise that companies should approach public authorities earlier. One respondent expressed the opinion that industry should get external partners to undertake risk communication for instance BfR assessments.

- **Credibility:** The *public authorities* identify the creation of trust and credibility as a *conditio sine qua non* of successful risk communication. *Environmental and consumer associations* call for improved crisis management by industry, for instance, by setting up emergency plans. Furthermore, industry should establish its own early risk detection mechanisms. This would document the responsibility of industry and could lead to a growth in trust amongst the population at large. *Industry* is also of the opinion that its own risk management requires improvement. Industry should transport the image of a competent and trustworthy stakeholder to the outside world. To this end, risk communication should be granted greater financial and qualified personnel resources and risk messages coordinated better within industry.

4.2 Presentation of results Focus groups

4.2.1 Focus group participants

Composition of the focus groups
Three focus groups were conducted with representatives from public authorities, representatives of industry and professional associations (industry), and representatives from environmental and consumer associations (NGOs). Two focus groups (public authorities and NGOs) were staged in November 2006, a third focus group (industry) in February 2007. There were 12 participants in the focus group for NGOs, eight in the focus group for public authorities and only four in the focus group for industry because of people dropping out at the last minute. For that reason after a first evaluation round, three additional representatives of large industrial companies were presented with the preliminary results of the focus group and asked for feedback. The answers were included in this chapter. A total of 27 people were interviewed, 24 people in the group interview of the focus group and three additional people in open (individual) interviews or through written commentaries.

The focus group *public authorities* consisted of equal numbers of representatives from federal and *Land* authorities; both ministries and downstream public authorities on the *Land* and federal levels were represented. The work areas of the participants are consumer health protection in the field of food safety, chemicals and plant safety.

The group of *NGOs* consisted of equal numbers of representatives of environmental and consumer protection associations as well as one representative of an agricultural and one representative of a chemical association. The representatives of environmental associations are mainly active on the federal level whereas the four representatives of consumer associations represent their respective regional associations. The areas of activity of the participants can be summed up, as can the interview sequence, with environmental and consumer policy interests, consumer communication and the provision of information and consultancy services for their own members. Food safety plays an important role in the work area of all participants.

Two representatives of large international companies from the area of chemicals, one representative of a cross-sector industrial trade union and one person who works in an advisory capacity for industry and industrial associations took part in the focus group *industry.* The main areas of work of the participants are chemicals, in particular toxicology, environmental sciences, nanotechnology and plant safety. The three additional industry representatives, who were interviewed at a later stage, were selected from the food industry and the chemical industry with the emphasis on food and also represent large international companies with registered offices in Germany.

The participants in the focus group represented a broad spectrum of practical experience and specialist opinions, which was very beneficial for the process and the presentation of the results.

The **risk themes**, which were covered by the focus group participants, largely correlate with the themes on which stakeholders were questioned in the interviews and represent the risks they deal with in their daily work: consumer protection risks with the focus on food were the main subject in the group discussions. Furthermore, they touched on technological risks, in particular accidental breakdown prevention and large technical plants, chemical risks, radiation protection and - to a slightly lesser degree – nanotechnology. Consumer health protection and its communication constitute the core area of work of almost all the representatives of public authorities, NGOs and associations and, to a large degree, industry representatives as well. For the focus groups, too, experts were selected who can draw on major expertise in the core area of the Federal Institute for Risk Assessment (BfR), consumer health protection. In contrast to the interviews what was noticeable was that amongst the focus group participants the industry representatives in particular concentrated very much on certain risk themes. The industry representatives almost all talk exclusively about the risks in their immediate work environment. In contrast, public authority and civil society stakeholders represent a roughly evenly distributed spectrum of risk themes.

Characteristics of the respondents
In contrast to the partially structured interviews, the specific characteristics of the individual participants were not systematically recorded but simply touched on in an introductory round. For that reason, the information about the exact functions of the participants, their background and their tasks are only available to the extent that they were mentioned in the introductory round. No written record was made, as particularly amongst industry representatives and NGOs there was a call for anonymity.

In the case of the *public authorities* the participants were either heads of departments or heads of unit, but in each case they were people with specific expert knowledge and tasks in the area of risk communication. In the case of *NGOs* and *associations* they were mainly expert staff members above all from the area of food and nutrition and decision-makers and representatives of press and public relations responsible for risk communication to consumers. In the group *industry* the participants were either heads of department or people with overarching tasks that encompass risk communication.

Only a few participants mentioned their **expertise background**. The participants in the industry focus group all have a natural science or engineering science background with the focus on chemistry or toxicology/ecotoxicology and plant safety. The professional background of the public authority and civil society representatives was more heterogeneous. Besides the natural and engineering sciences, this group also encompasses social scientists, agricultural scientists and farmers.

4.2.2 Understanding of the terms: “risk” and “hazard”

One key theme of focus groups had to with the **terms “risk”** and **“hazard”** in risk communication. The goal was to identify the way the stakeholders understand and the context in which they use these terms and to clarify why they are used in different ways. In the group interviews in particular the causes of the various approaches were to be identified and discussed.

ORIGINAL SOUND PUBLIC AUTHORITY
“The terms are mixed up and it is impossible to clearly separate them from each other.”

The moderators presented as the first question to representatives of industry, NGOs and public authorities the working definition for these BfR terms[10]:

*The term **"hazard"** describes in toxicology the inherent potential of a substance (chemical) to cause adverse effects in the target organism. Dose-response relationships are the basis for this.*

*The term **"risk"** is the product of the scale and probable occurrence of damage. Exposure data are the basis for determining probable occurrence.*

After that the stakeholders were asked about *their understanding* of the terms and the use of working definitions for these terms in their work environment. In a second step the groups of stakeholders public authorities, industry and civil society were to explain their differing use of the terms, list the causes and problems of use and identify solutions for the uniform handling of these terms.

Use of the terms

The various working groups do not define or use the terms "risk" and "hazard" in a uniform manner. Table 14 gives, by way of example, the statements from participants in the three focus groups about the two terms from the angle of the respective stakeholder group. All stakeholder groups confirm that they are familiar with the BfR working definitions but that they are rarely used in this form in their communication with the public at large. One industry representative comments "this definition is used in risk communication between experts".

ORIGINAL SOUND PUBLIC AUTHORITY
"It's amazing that people can communicate with each other at all because everyone has a different understanding of the terms."

According to the statement by one public authority representative, the definitions were laid down for the public authorities in statutory foundations, e.g. the Ordinance for Food Safety and these statutory provisions were binding for the public authorities. "The use of terms laid down in conjunction with a legally binding objective differs from discipline to disciline (e.g. food, chemical law) in the various public authorities, too. Hence no legally binding provisions can be supplied and therefore own, founded (perhaps recommended by recognised scientific bodies) definitions are needed", commented one public authority representative.

The European Regulation (EEC) No. 178/2002[11], in which the terms were defined, was rarely used, too. The representatives of NGOs and industry also indicate that they do not use their own internal working definitions in their rules of procedure; they use these terms in an isolated manner or sometimes swap them round or chose other terms (cf. Table 15) depending on the target group of their communication. In the communication process the terms were sometimes used as synonyms as the target groups were not all aware of different usage. This lack of clarity had to be managed in risk communication.

The public authority representative pointed to the pleonasm in respect of the German term "hazard potential". Hazard already expressed the possibility of damage; the word "hazard potential" was tautological and meant the possibility of the possibility of damage. The term should, therefore, be replaced by the term "hazard". This term is not clear to the public at large. One industry representative said where there is danger (in hazard), there is also danger and danger is something we don't want.

[10] Federal Institute for Risk Assessment (BfR) – Working group on health assessment: guide "Format für gesundheitliche Bewertungen". Status August 2005, 21-1000-31/01, pages 9–10

[11] Cf. note 9.

Definition of the reference base
Both the *public authority* as well as the *NGOs* agreed that the reference base for the definition should definitely be clarified. The BfR definition presented was overly one-sided and toxicological in the opinion of the *representatives of public authorities* in terms of the word "substance". The term "substance" was not uniformly defined across the different legislation. The BfR definition should be extended for the purposes of simple communication to include the biological and physiological components. The *NGO representatives,* in contrast, would like to see the health impact included which means that the definition should rather include man/human health and the entire environment as protection objects. Various experts from public authorities, industry and NGOs also mentioned the term "systemic risk" that encompassed the social impact. However it should be mentioned that in risk research "systemic risk" does not mean widening the horizons concerning the extension of hazard to each and every risk but was a quality that was inherent in specific risks and goes beyond social impact (cf. Renn 2005). This understanding is, therefore, to be seen as completely independent of the differentiation between risk and hazard.

ORIGINAL SOUND PUBLIC AUTHORITY
"Everyone understands the word risk! Everyone means something different and that's why people like to use this term."

Conclusion: The public authority representatives have different definitions of the terms in each discipline but do have a clear understanding of the terms. This also applies to the representatives of NGOs and industry, who also see and use -depending on the discipline - different associations (reference base) in the definition. The understanding of the terms was not, however, always completely clear amongst the representatives of NGOs and industry. Few of the institutions interviewed had their own, internal definition lists aside from the definitions used in (eco)toxicology (see Table 14).

Table 14: Understanding of the terms "risk" and "hazard" from the perspective of different stakeholders

Hazard	Risk
Public authorities	
• Danger that has crossed a specific threshold value • Hazard is the classification and ensuing labelling of a substance according to specific properties; this is then differentiated by different effects (in chemical legislation) • In the field of chemical legislation and incident legislation (plant safety), the term "danger" is used and not "hazard" • Describes a possible hazard (term hazard potential pleonasm in German) • Danger would be the abstract probability of occurrence • Reference base too narrow: expand to include biological and physical effects • Hazard is a situation-dependent state (the potential that there could be an effect in the event of danger)	• In substance legislation risk is not defined as the product of starting probability and probable occurrence but as the relationship (quotient) between exposure and effect threshold (systemic risk potential, authors' comments: what is probably meant is "maximum daily intake") • Probability of occurrence and scale of danger (ordinance for food safety) • Product of scale and probability/expected frequency • Product of scale and probable occurrence as a consequence of the danger occurring • Risk is simply a new word for probable occurrence • EU directive for risk definition[12] • Systemic risk
Environmental and consumer associations (NGOs)	
• What a substance can cause from the qualitative angle • We talk about dangers or "hazard" • Hazard refers to the trigger • Term is defined too narrowly, we have included the social effects (systemic danger)	• Risk is the negative probability of occurrence • Risk refers to the event • Systemic risk: reference base is extended to include social impact • Possible damage • Product of frequency of damage and probable occurrence • Mainly scale is to the fore of communication, the risk is always relatively low (communication of large scale damage events)
Professional associations and companies (industry)	
• We understand this to mean hazard • A danger, a dangerous property; still has nothing to do with whether someone is harmed or can be harmed. This is only the case when there is in fact exposure to the substance. This means when I come into contact with the substance then there is a danger. • Definitions are laid down scientifically. We do not have any others. They are accurate and therefore right.	• Risk is the generic consideration; include side effect, the mode of action or the effect • Only through the handling, the way in which I deal with this dangerous property (substance) can I decide whether there is a risk or not • Product of probable occurrence and scale of damage with additions (insurance formula)

[12] Cf. Note 9.

Use of the terms

The term “hazard potential” (in German) is used relatively rarely according to statements by the participants from all focus groups in communication within public authorities, companies or NGOs (internal communication) and by extension in the work situations of institutions.

ORIGINAL SOUND PUBLIC AUTHORITY
“I would never use the word “hazard potential” for reasons of clarity. The average consumer doesn’t know what to make of it.”

In direct communication with the public at large (external communication) the term was almost never used. The term “risk”, in contrast, was used more frequently.

According to the NGOs and public authorities the terms “risk” and “hazard” are only used on the scientific level or by expert circles (internal communication) who assess risks. Here use normally corresponded to the meaning of the terms. If they are communicated to the outside world then the terms used are dangers or effects. The industry representatives also tend to use in their communication with the population at large (external communication) descriptive terms like for instance “danger”, “damage”, “crisis” or “hazard” (cf. Table 15).

ORIGINAL SOUND PUBLIC AUTHORITY
“I think these terms are used in expert hearings. Our experts use them of course when they are accepted common practice in the ex-

Table 15: Substitutes for “risk” and “hazard” from the participants

Substitute terms which describe the situation of risk/hazard	
Substitute terms for internal, inter-colleague communication	
• Risk potential, systemic risk potential • Danger, (potentially) dangerous • Hazard • Threat • Damage	• Protection, protective measures, safety • Hazard • Probable occurrence • Limit values
Substitute terms for external communication, specifically for public relations	
• Danger, (potentially) dangerous • Threat • Scale, effects • Dangerous properties like explosive or carcinogenic	• Damage • Fear, caution, warnings • Crisis

Conclusion: The term “hazard” was used less according to the statements of all participants, the term “risk” slightly more frequently. In the public authorities the terms “risk” and “hazard” were chosen not only in internal but also in external communication. At all events the use of the terms was not uniform. Amongst NGOs and industry representatives the relevance of the terms was also low and their use somewhat diffuse, i.e. the terms are sometimes swapped in their meaning or replaced by other ones. The experience of the stakeholders shows that the terms are not clearly demarcated in the communication process. One industry representative has the impression that the simple term “danger” is the best way of describing the situation for the public at large, “Many things are dangerous, a sharp knife, a toxic mushroom, a fast-flowing river etc. and people know that without necessarily having to conclude a major risk for themselves because they also take into account the exposure side. The river is dangerous but if I do not fall into it or stay away from it, the risk is negligible.”

This conclusion did not, however, apply to the experts/expert circles of all stakeholders who assess risks. Here attention was paid to an exact definition even if the definition differed between expert circles. Here the experts use the terms in a congruent manner.

Explanatory variables for the different use and mixing of terms
All groups furthermore agreed that the terms are mixed up and that they were not clearly demarcated from one another at all. This opinion was shared by public authorities, NGOs and industry. The following reasons are given by the participants in all groups for the different usage of the terms:

- **Multidisciplinarity – communication between different institutions (inter-colleague communication):** The mixing up of the terms had to do with the different disciplines which work separately from one another and had little exchange in terms of terminology or concepts. Depending on the discipline there are different standard terms: in the food area the experts talked about different risks from the ones in the construction industry and each expert had his own, highly complex definition of risk and hazard. This meant that the contents could easily be mixed up and confused when communication took place between different disciplines and, by extension, between different institutions too.

ORIGINAL SOUND NGO
"The word 'hazard' is the pet hate of every journalist who reads the press release. Where there is a hazard then there are of course dangers or risk and that's what leads to the confusion."

- **Communication within institutions or members (internal communication, internal clientele):** Within institutions the terms tend to be used more or are described using synonyms. The goal of communication was to show people on the grassroots level that "We have not forgotten the topic, for instance atomic energy and we will continue to keep our eyes on it. Of course, this is quite different from providing a service to consumers (quote NGO)" who expect concrete action instructions.
- **Communication for different target groups, consumers (external communication):** In communication with consumers journalists cannot use the terms because they were far too woolly for consumers. The consumer would like to learn concrete things like "you can do this or that or something else" (so-called service press releases). Then he would know how to deal with the hazard but many representatives or focus groups thought it would be problematic to use the word "hazard" in communication with consumers. It was not well received and was not understood. The same applied to the term "risk".
- **Press releases for opinion leaders/multipliers (external communication):** Besides pure public relations, press offices draw up releases for input into the political discussion and for multipliers. "Even when politicians are in my sights, I communicate for the general public. The best way of securing their attention is via the public nature of the information, by creating public opinion. Here, again, the level of understanding is such that each newspaper finds it newsworthy and also prints it (quote NGO)."

ORIGINAL SOUND NGO
"You just want to use a popular press style and nothing is that simple, people tell me again and again. 'But I have to write that simply, I reply. These are the usual discussions in all associations between the experts and press office. In our case this language communication doesn't go through the press office.Not even with the objective of trying to show our scientific expertise."

- **Diffuse understanding of the terms:** According to the representatives of public authorities, industry and NGOs, the public at large had a relatively similar understanding of the terms "hazard" and "risk". Politicians also frequently use these terms as synonyms. In the communication of the press offices the terms are used in a differentiated manner only in communications intended for the scientific community.

- ***Conclusion:*** If one sums up the results then multidisciplinarity, the different target group-orientation of communication, which is above all oriented towards intelligible communication for the target group (inter-colleague, internal-external communication) and an unclear understanding of the terms are responsible for the non-uniform use and mixing up of the terms.

ORIGINAL SOUND INDUSTRY
"When someone talks about a danger but calls it a risk, then that is the way it is. People don't make anv distinction. that doesn't work."

4.2.3 Challenges facing risk communication

In the focus groups the experts discussed the key problems of risk communication based on the central question "When you communicate hazards and risks, what problems do or do not occur? What worked well in communication?" They were asked, if possible, to refer to concrete examples. In addition already in the introductory round, the participants were spontaneously asked using keywords the question "What works well in risk communication and what doesn't?" which means that already at this stage, the communication problems could be recorded.

ORIGINAL SOUND PUBLIC AUTHORITY
"What about risk communication when you talk till you're blue in the face and no-one wants to listen?"

The **categories**

- Underestimation and overestimation of risk perception
- Incomplete information and a lack of transparency
- Uncoordinated communications strategy
- Various goals of the stakeholders
- Instrumentalisation
- Inadequate communication skills
- Differences in definitions and understanding
- Media impact

were discussed in the three focus groups by the participants as problems in the risk communication process.

Risk perception
Public **risk perception** was deemed to be problematic for risk communication by all participants. As shown by the studies, a voluntarily assumed risk like alcohol or tobacco consumption tends to be underestimated whereas external risks, which are imposed on the population, tend to be overestimated. There is "a discrepancy in the case of risks that can be influenced. They are almost always deemed to be less serious than risks where you are powerless to do anything. This lack of power raises awareness, leads to a risk being classified far higher than something which I can influence myself" was the comment by one representative of a consumer protection association. The industry representatives shared the opinion that the population underestimates risks it can influence itself (e.g. tobacco, alcohol or driving) and overestimated risks it was less able to influence (plane vs. car). The focus of discussion was, however, on the area of the overestimation of risks as, generally speaking, their primary task/area of work is not to draw attention to the risks of overeating, drinking, skiing or other things.

Furthermore, risk perception by the population was discussed in the group discussions as problematic for two reasons. Firstly, the need created amongst the population at large by the

overestimation of external risks for a zero risk. This was discussed in particular by some NGOs according to representatives of public authorities and industry. But also, this was the opinion of several public authority representatives: a lack of risk perception could prove problematic for risk communication. There were risks, particularly in the area of food, that were not the subject of public interest because of a lack of coverage in the media. This was, for instance, the case for health risks associated with ethyl carbamate which was formed during the incorrect production of stone fruit spirits and also in plasticisers in twist-off lids. Subjects, which were not taken up by the mass media, were very difficult to put across to the general public as there was practically no risk perception, "What could possibly happen? An actual risk is to be communicated and it is not taken on board," explains another public authority representative.

Incomplete information and lack of transparency

Late, incomplete **information** as well as a lack of **transparency** in risk communication were mentioned above all by public authority and NGO representatives but also by industry representatives as one of the main problems of risk communication. Public authority representatives criticised in particular the apparent, internal withholding of information when a risk occurs. This had led, for instance, in the case of the onset of BSE in Germany to a major loss of trust by the population. When a new theme (e.g. BSE) was identified and discussions began about it amongst the general public, there was frequently only inadequate information available on the hazard and actual risk. Furthermore, this often led to an incomprehensible reticence by public authorities in the eyes of consumers and industry, too, as the latter could only then comment on the risk when the data situation was robust, i.e. well-founded information is available on the "hazard" and "risk".

ORIGINAL SOUND *NGO*
"…That no concrete information is available which could be taken over into our daily work."

Furthermore, it was criticised that the **all clear was** repeatedly sounded too early and this led to distrust amongst the public at large as this practice in the past had turned out to be wrong for many risks retrospectively (for example asbestos and BSE). "All the same, one had to be careful not to point out potential risks too frequently because that causes problems later. Too many false alarms led to more tense and false reactions when something really relevant happened."

ORIGINAL SOUND NGO
"…And when you do actually ask the ministry then you frequently learn that they don't know anything about it because the information hasn't yet reached them. Or when it is about specific things, I have even been asked whether I could pass over documents; "because that takes too long with us"".

One example for the lack of trust was electro-magnetic radiation for which the communication strategy tended towards the all clear. This met with distrust because of the population's experience with other risks. One public authority representative even talked about "conscious misuse" and "willing acceptance" when it comes to the holding back of information in conjunction with hazards for the population from plant safety. The NGOs and associations also all criticised in particular the lack of transparency when a risk was observed like for instance a substance in a food that is harmful to health but the products weren't named in which the limit value had been exceeded. Here there was a lack of courage to undertake pragmatic actions by the public authorities, for instance publishing product or manufacturer names or the obligation to remove the contaminated products from the market. The ban on CFCs was the only example of courageous action by the public authorities, "so these examples do exist but I think the occasions when people show the courage to actually do something are relatively rare", commented one civil society participant. Furthermore, there was a delayed passing on of information by the public authorities to the consumer associations and NGOs like in the case of coumarin in cinnamon, "Before things really starting happening, the products had already been delivered and many of them were already on supermarket shelves and had, of course, been sold". This was the comment of one representative of a consumer protection association. The NGO representatives all agree with the opinion of one participant who

called for the rejection of products which are not as they should be, full examination of all products on the market and the naming of names. The reason for the cautious behaviour of public authorities was, in the opinion of the NGOs, the fear of damage claims by industry (see also next section).

Uncoordinated communication strategies

A lack of systematics and the **poorly coordinated communication strategies** of public authorities were criticised by representatives of public authorities themselves and, more particularly, by representatives of NGOs and consumer associations. It was frequently the case that within one public authority there are varying levels of knowledge and consequently different information was provided. The public authority representatives in particular criticised the fact that their own institutions do not communicate to the outside world "with one voice".

Different goals of stakeholders

The **different goals of risk communication** and the related **exertion of influence and instrumentalisation** were also described as very problematic in risk communication. Different interests and motivations for risk communication were discussed in all three focus groups. The public authority representatives mentioned in particular risk reduction for the population in line with existing laws and provisions as the communication goal, be it through minimising risk sources or achieving changes in the behaviour of the population through information. For NGOs two central goals were mentioned: firstly the demand for a zero risk for the population for a number of risks combined with the demand to public authorities for pragmatic decisions along the lines of bans on products or substances and secondly increased risk maturity of the population which was understood to mean in the group discussions the possibility to take an informed decision.

The civil society representatives voiced the criticism of scientists and communicators on risk communication in public authorities that they sought "to get society to accept risk. It wasn't about really accepting and warning about risks but about developing strategies to make risk technologies acceptable", commented one association representative. Furthermore, the NGOs stated that their opinion was not always taken on board; they were only really involved when this suited the public authorities, "…when our advice is in demand. […] And when our advice is not sought then it is blocked" commented one NGO participant.

Finally, for industry representatives the main goal of risk communication is to increase acceptance of their products and their own credibility. Credibility problems are for them the main stumbling block in risk communication and specific strategies were required like for instance joint studies and appearances in socially recognised independent institutes in order to recreate this. The demand by NGOs for a "zero risk" was unrealistic as there was no such thing.

ORIGINAL SOUND INDUSTRY
"*…On the industry side we have the problem of credibility. When we say something it is not the same as when someone else says the same thing".]*

Industry representatives have a clear idea about the different goals and motivations of various social groups. In line with the statement by one industry representative there is also a clear idea about how these different interests impact perception in the population, "the problem is that we still have very different interests. And when different interests say different things, then this is not well received by the target group, the population. Then, of course, on the one side we have the interest group industry seeking to sell their products. On the other side we have the so-called protectors of the population. Some NGOs see themselves in this light although what they are really selling are their beliefs", said one participant in the industry group. Industry also criticised the one-sided communication of risks and the lack of information about the associated benefits.

One communication problem arising from the "ideological entrenchment" of NGOs was also observed by public authorities and industry representatives. Hence, there was a point from which this became so vehement that language and content substantiations were no longer possible. One public authority representative said that many NGOs were groups who constantly demanded a zero risk for society.

Instrumentalisation

The instrumentalisation of risk communication is criticised above all by NGOs. One NGO representative said that the food industry, for instance, endeavoured to advertise products using endorsements by renowned TV chefs, that had been criticised because of harmful ingredients. Furthermore, the criticism was expressed that industry was smuggling its paid experts into functions in ministries in order to influence legislation. Furthermore, some participants said that the influence of industry on statutory limit values was "gigantic". From the angle of NGOs public authorities found themselves facing a conflict of interest between industry and consumer protection. The fear of compensation claims by industry prevented more energetic action on behalf of consumers. One example mentioned in this context was the Birkel scandal that had led to a claim for damages. One NGO representative commented further, "I also think that we can scarcely push through the [limit value for coumarin] if we maintain our case law because claims for damages will then follow."

ORIGINAL SOUND NGO
"…How many experts paid by industry are in the ministries and help to write the laws? It does not surprise me that that is something which is picked up again and again. I think that this is an impossible situation, which should not be allowed. We always talk about our best laws, about our independence but that is no longer the case once industry quasi sends its experts, who speak for them, into the ministries who are then involved in drawing up laws and also then paid for that. I think that is a completely impossible situation."

Inadequate communication skills

Inadequate communication skills were finally mentioned by industry representatives as another major problem in risk communication with the public at large. This had to be improved in their own ranks and also amongst public authority representatives. This could only be achieved through targeted communication training which should meet two goals: firstly the intelligible communication of complicated facts which nonetheless presented the situation in a correct manner; secondly a communications style that conveyed credibility, openness and expertise. The demand of one industry representative, "I would suggest that everyone who has something to do with the theme risk should undergo communication training, I do not mean media training, […], but communication training is something we should all have undergone."

ORIGINAL SOUND INDUSTRY
"*Yes I could tell you so many things from practice from the company side but also from the public authority side of just how badly or helplessly we, in some cases, communicate with the outside world."*

Differences in definition and understanding

Problems in the communication of the various **differences in the definition and understanding of risk and hazard** and their **translation into communication with the general public** are closely related. Associations and NGOs frequently experience problems between the expert department and press office as information could not be communicated to the public at large in technical jargon but had to be "trite" and "simplistic". This also applied to communication with political decision makers but was different in the case of representatives of public authorities who were generally experts. This was an ongoing dilemma: too simple meant as a rule regulating things in a manner that was far being from optimum for society, i.e. to their disadvantage; too complicated led to acceptance problems.

Media impact

ORIGINAL SOUND INDUSTRY
"But a third and very important group is, of course, the press."

The **role of the media** was deemed to be central to risk communication by NGOs and industry representatives. The media decided which risk topics were present in the awareness of the public at large and whether they were seen in a positive or negative light. NGO representatives assumed that industry exerted an influence on the media, which meant that criticised products or topics were consciously presented in a positive light. The main concern of the press was not to provide factual information but to sell a product. One industry representative said that this was easier with non-factual and highly simplified communication in the case of highly emotional themes.

This had for example been the case for coumarin in cinnamon. "I, too, thought now they are sending in a starred chef to a talk show so that he can promote cinnamon. Then I thought it is going to be relatively difficult for us to grouse about that" (Original sound NGO). The public authority representatives commented that it was often difficult to deal with the press because the impact of their communication could not be controlled. Another problem was that, when it came to successful, transparent risk communication, there was often pressure from the media to quickly chalk up success in risk reduction.

4.2.4 Framework conditions of successful risk communication

ORIGINAL SOUND NGO
"In risk communication 'reporting' is frequently confused with effective communication."

The participants in the focus groups saw "the voluntary assumption of risk" and "their own ability to control risk" as important framework conditions in risk communication. They confirm a phenomenon from risk research that people estimate controllable and voluntary risks as less hazardous than risks to which people are exposed involuntarily and which they cannot influence. "People ignore risks", commented another participant. There was extensive risk communication on cigarette packs but that did not bother smokers. Risk communication had to make something happen or bring about change otherwise it served no purpose.

Table 16: Foundations of "good" risk communication

Good risk communication of the focus group	
...Public authorities	
• Communicators give consumers action instructions to consumers, not terms • When it comes to developing a strategy for dealing with the risk, inquiries from consumers are taken into account. • Communication is done centrally via a press office. Technical questions are only answered by experts.	• Communication via the Internet and fora makes sense and is target-oriented • Selection of groups who communicate with one another and discuss is very important (good mixture of advocates and critics) • Focus on flexibility, openness, scope for action and freedom
...Environmental and consumer associations	
• Risk communication goes beyond information and aims to achieve genuine "two-way communication" • There must be a mutual exchange • A concerned person approaches a company and asks for specific information and is also given it • Tenacity, endurance and a high level of frustration tolerance in the person dealing with this. • "It is enough if I reach a few people because I cannot change the entire world.	• Person concerned is only then happy when he receives the right amount of correct information • "With the new Consumer Information Cct, which is on its way, good communication should actually be achievable. Then trust could be regained." • Pursue the goal of making information about risks available to interested citizens.
...Professional associations and companies	
• The overall process is documented in a transparent manner so that interested parties can join in later and quickly acquire the available knowledge.	• In the case of residues be as open as possible, give the name of the person responsible and guarantee call-backs. • Place risks in a context (e.g. when you mention the risks of air traffic also mention the risks of road traffic)

The risk-mature citizen/consumer

ORIGINAL SOUND NGO
"…In our system there must be sufficient transparency that when someone wants this information he can get it. That is also what I understand as being an informed citizen."

Although the terms "risk-mature citizen or consumer" were not originally included in the working questions of the focus groups, the terms "risk-mature", "informed citizen" cropped up again and again in the discussions of the focus group of environmental and consumer associations and public authorities. The NGO focus group then discussed what makes a citizen risk-mature and how "risk maturity" can be improved. They say that the informed citizen/consumer ideally has all the information about a risk, orients his actions towards that and changes his behaviour when, for instance, he can chose between grapes contaminated with pesticides which he buys in the supermarket or the expensive organic alternative. To this end the consumer needed information about the contamination of grapes and the possible effects of buying and eating the contaminated grapes. The informed citizen had a great deal of power by purchasing or boycotting goods and products. However, too much information and media feedback can damage and tie up valuable capacities as was, for instance, the case with "Bruno the bear". It triggered major media coverage and emotions.

Table 17: Aspects for a risk-mature citizen from the angle of environmental and professional associations

Selected contributions on a "risk-mature consumer/citizen"	
• The informed citizen has considerable power, for instance in the case of the oil platform Brent Spar. He can switch to a new garage, in the case of grapes contaminated with pesticides he can go to a different supermarket. • Good risk communication would help to develop informed citizens who in future always consider the risk when taking action. • The consumer develops recommendations himself in order to deal with the risk. • The informed citizen must be equipped with information sources or develop them himself.	• I can't think of very many examples of communication but I can of good advertising campaigns for instance on Yello Strom. • The "Bruno" bear case was a problem as this tied up considerable capacity which could have been used more effectively elsewhere. But the informed citizen knew a lot about this case but this was a shame as it was a superficial story..

Success control of risk communication

ORIGINAL SOUND NGO
"You can't actually judge yourself what people exactly want or need right now."

Like "risk maturity" success control, i.e. what citizens have taken on board and implemented, was not discussed in the focus groups; nonetheless, participants did report isolated cases about problems of success control. Afterwards it was not possible to clearly determine what impact communication of a risk would have developed and whether an open and transparent approach would have *per se* been beneficial or detrimental. The public authorities provided comprehensive information about coumarin. Nonetheless, one participant was of the opinion that during the festive season no fewer cinnamon biscuits were eaten than before the coverage. The recording and analysis of good and bad examples of risk communication could help to create more clarity about successful communication. The consumer advice bureaus always record lively press coverage for example in response to their press releases but this did not permit any conclusions about the specific actions of citizens.

4.2.5 Examples of participants from practice

The project team focused in another main area on the experiences of the participants and put the working questions "What communication pratice has proved its worth in your opinion?" and "Are you aware of any good examples in your institution involving risk communication?"

The groups reported a wealth of practical examples in which risks had been successfully communicated. They can be assigned to the main areas

Main area 1: Good examples of a comprehensive discussion
Main area 2: Dialogue with citizens and stakeholders
Main area 3: Media participation
Main area 4: Communication with stakeholders

Main area 1: Good examples of a comprehensive discussion

The participants in the focus groups reported practical examples to the project team, which extend far beyond the provision of information over a longer period. They listed examples that, in the opinion of the focus group, constitute good risk communication.

Genetic engineering in Baden-Württemberg

The public authority focus group thought that the "genetic engineering field tests in Baden-Württemberg" were particularly interesting and successful. In an area that was otherwise free of genetic engineering, the *Land* Baden-Württemberg had launched a project involving the release of genetically modified plants. In the run up there had been huge protests and the

debate focused on the question “May I and can I do that?”. The special aspect here was that the Ministry of Food and Rural Areas had decided to involve NGOs in the communication process in addition to industry representatives and scientists. Despite the explosive nature of the topic, the otherwise so different target groups were able to talk to one another, deal with one another in a respectful manner and the group developed the consensus that the test could take place as long as large distances to other areas were maintained.

Risk dialogue Switzerland
The foundation “Risk dialogue” with its registered office in Switzerland had the task of initiating a dialogue between social stakeholders on risks. The activities of this foundation are deemed to be very positive by one participant in the company focus group, i.e. events and other activities for instance on nanotechnology or security of the Basel Rhine harbour. They encourage the active examination of risks. A peer organisation to the foundation for risk communication does not exist in Germany so far.

Citizens protests about hazardous waste incineration plant
The example “Citizen protests about hazardous waste incineration plant” was mentioned by the public authority focus group. In conjunction with the planned extension of an incineration plant for hazardous waste the citizens came and protested on site. Two round tables, one by operators and one by scientists, representatives of public authorities and NGOs were set up. Although no consensus was reached, the stakeholders established mutual trust and the communication at the round tables was constructive. This resulted in a brochure and scientific studies. They contain the comments of the people concerned or the stakeholders and the overall communication is accurately depicted. Because of political changes the process has currently ground to a halt.

Example nutrition dialogue with the population
One successful example of a communication process, in the opinion of one of the participants from the NGO focus group, was a dialogue about nutrition with the population. Experts drew up a list of the “ten most highly contaminated foods” and established on this basis signal values for the contamination of food with a view to lowering the exposure and, in this way, continuously minimising consumer exposure. The focus was on options for dealing with the contamination. The customary limit values were not established.

Main area 2: Dialogue with citizens and people concerned
The participants recommended taking a very critical look in advance at the target group and its needs before launching a communication process. The more specific and more “nicely” people dealt with a target group, the easier it was for the communicator to achieve something in the target group.

Dealing individually with people seeking advice
In the dialogue with consumers good practice should mean not having any pre-fabricated answers but rather reacting individually to the caller’s personal enquiry. Participants from the focus group of consumer and environmental associations talked about their positive experiences with telephone campaigns and direct and individual communication with concerned citizens (see also example “Call centre avian flu”). Newspapers normally present a topic to the public at large on which they would like to have more information and have questions. Only in the course of an individual conversation did the people seeking advice develop their questions. The consultant only recognised through this combination what kind of answers the caller expected, how differentiated these should be and what was acceptable to him. A brochure or press release could not do this and was more a preliminary step. The consumer frequently asked about simple solutions and action alternatives. He wasn’t interested in knowing every detail, as there were other topics, which he had to deal with and process in his everyday life.

Individual counselling on the telephone did, however, have its limits when staff capacities were not sufficient to deal with topical issues. However, in the case of less complex topics, like some of the general (recurring) FAQs (Frequently Asked Questions), people could be redirected to the Internet.

Call centre for consumer enquiries about avian flu
For a long time the topic avian flu was very much centre stage of media coverage. One of the public authorities directed a large number of consumer enquiries to a call centre. Prior to that experts had compiled standard questions and answers, which enabled the staff at the call centre to give adequate answers to most enquiries. They only passed on the calls to a scientist when they really couldn't answer a specialist question. Other consumer advice bureaus set up hotlines in cases of crisis to answer individual questions.

Carefully select and adapt target group and topic
In the NGO focus group the participants also mentioned a frequent "saturation" of risk topics. For instance, one participant regularly offered women's organisations the topic "chemicals in everyday life" as a lecture. The critical examination of this environmental topic and the recommended changes in behaviour often went beyond the capacity of many listeners. If, however, the topic is very exactly tailored to the target group, the feedback is good. For example the adapted topic "chemicals" met with good feedback from the target group of parents and future parents. This prompted the participant to launch a new project "building a nest" to offer new parents help for their first child and ideas on how to shape a healthy living environment.

Sometimes risk communication can reach completely different target groups from the ones originally intended. A comic that deals with mobile phones and was intended for children and adolescents is well received because of the simple depiction and the interest of older citizens, too, in further information.

Main area 3: Media involvement
Emergency plans, crisis plans and a "dry run"
In the case of the nitrogen scandal which dates back some years, the organic industry was forced to accept that it was unprepared and was overwhelmed by a "mega topic" and the media response. The sector and companies have, however, learned a great deal from this media debacle and the information vacuum. They had drawn up emergency and crisis plans about how to behave in these situations. They contain decision-making processes and action patterns in order to ensure that a similar case or a crisis could be tackled better in terms of communication. Initially the communication must function internally within the industry (internal communication) in order for it to be carried outside in a congruent manner and avoid confusing the public at large.

Dry runs are one way of practicing communication in a crisis. In a project involving the chemical industry and users, staff practice how to provide adequate information and communicate this in a protected learning environment using a case study.

Direct approach and involvement of journalists and NGOs
One representative from the company focus group had had good experience with direct communication with journalists. The chemical associations organise, for instance, journalist trips and seminars. They take up mostly negative topics and discuss them from a fresh angle.

Another opportunity involves – this is what happened during the celebrations of a company anniversary – inviting public authorities, critical groups and also journalists to events and actively involving them as stakeholders. The company wanted to convince the journalists that

the industry had learned from chemical accidents and that they now deal with the topic of safety in a highly proactive manner.

Main area 4: Communication with stakeholders

Eco-institute as a stakeholder

One representative of industry reported about the "Co-Nano-Project" that they are jointly conducting with the eco-institutes in Vienna and Freiburg. They had consciously got an institution on board that asked critical questions about various aspects and, at the same time, had substantial expertise. The eco-institute was a potential pro-stakeholder but also a neutral institution that enjoyed an excellent reputation amongst the population at large. If the eco-institute were to establish through an analysis that the benefits of a substance were predominant then there was a relatively good chance of achieving acceptance amongst the general public for this type of product.

Round table with all representatives

The public authority and NGO groups touched on various practical examples in conjunction with potential radiation risks from mobile telephones. What is important above all is that despite the emotional nature of this topic communication and an exchange of opinions between industry, public authorities and stakeholders was actively sought in a longer, trust-based discussion process.

Within the framework of the German mobile telephone research programme, various institutions took part in a round table (including mobile phone providers, consumer protectionists and the radiation protection committee). The round table served the purpose not only of promoting the scientific discussion of research projects but also of improving the exchange of information between the stakeholders and communication about the programme. The stakeholders have recognised that individual awareness-raising is possible on specific topics. It was a good step in order to enter into contact with various groups. The group met five times over a period of two years. Whereas there had been initial difficulties in communication as the participants came from such different backgrounds, communication had since improved and the exchange of opinions and open criticism were possible.

Dialogue with all interest groups

The detergent industry had for years pursued the initiative entitled "Sustainable Washing" which is obviously more than a round table. Initially the idea had been for a pure stakeholder discussion to which all interest groups including environmental associations, consumer associations and housewives had been invited. First they discussed how environmentally compatible detergents actually are and secondly how necessary they are. This had led to joint activities by industry and stakeholders who wanted to convey correct, sustainable washing processes to the public at large. The special feature here was that almost all detergent manufacturers, i.e. competitors on the market, took part and wanted to share their expertise.

Networks on communication in agriculture

In agriculture the examples of genetic engineering or nutrition sovereignty had proved their worth when it came to creating networks with highly cooperative churches, cooperatives and feed manufacturers. To this end, all interest groups had frequently been contacted and invited to take part in the network.

4.2.6 Requirements of and wishes for “good risk communication”

In contrast to the individual interviews, the wishes for improving risk communication were not systematically addressed in each focus group for all three stakeholder groups. The question was what the participants wanted in respect of a wish list for **improved risk communication** and what could be improved (for NGOs and industry) in **cooperation with public authorities**. The public authorities were asked more particularly about how associations, NGOs and industry can be involved in the communication process. Furthermore, the participants were asked in the introductory round to give a brief statement about what they understand as good risk communication. The responses to both questions are presented here.

Full information and transparency
In order to guarantee **timely and full information** to the stakeholders involved, all three groups of stakeholders felt that greater **transparency in the process management of risk assessment and communication** was particularly important. The representatives of NGOs and consumer associations gave the example of the setting of limit values, which were not transparent when viewed from outside the public authority.

ORIGINAL SOUND NGO
“*Where does the money come from? That is the most important thing!”*

Risk communication oriented towards transparency and honesty was also mentioned by public authority representatives as being exemplary for good risk communication. This, however, was frequently not the case. Public authorities were “often not willing to show how they [came to] their decisions”, was one criticism voiced by public authority representatives themselves. However, this was essential for good risk communication.

ORIGINAL SOUND INDUSTRY
“Well in my opinion it’s important for various interest groups to talk to each other and to endeavour to give the population, that is our target group in this case, information which it can really use, which it can really understand”.

Furthermore, representatives of civil society in particular felt that the **transparency of scientific studies and publications from expert bodies and their background** was insufficient. In the case of risk communication by public authorities it was frequently no longer possible to identify who was the author of the underlying studies and above all who had financed them. This was, however, imperative for the credibility of communication and the scientific knowledge behind it.

The representatives of NGOs would also like the reporting from expert bodies to be more transparent. As position papers of this kind were generally approved by a majority vote, minority opinions were not sufficiently taken into account and the establishment of the position was not transparent enough. One NGO representative made the following demand, “I would like expert body meetings to be public. I would like the documents that are sent out and which were not always approved on the basis of a consensus to reflect the differentiated positions of all the participants and not just the majority positions. Otherwise, the opinions of the 15%, 18% or 20% minority are swept under the table”.

Stakeholder dialogue
This also applies to the **stakeholder dialogue** which was called for to a greater degree and seen as positive by all the groups. Here too, the early and “genuine” involvement of all relevant stakeholder groups could guarantee transparency. A dialogue only then made sense when all the stakeholders had the same level of knowledge. The first task of risk communication was, therefore, an exchange of information according to one industry representative.

The various participant groups focussed on different aspects. Whereas the industry participants wish to see very clearly consensus-based methods of stakeholder involvement (like consensus platforms, round tables or government committees), the NGO representatives again criticised the fact that here, too minority opinions, that contradict the consensus were

frequently left out of the reports or studies and were not, therefore, communicated to the public at large. Transparency in the case of a lack of consensus was also mentioned by the industry representatives as an important component for successful risk communication. “The decisive question in this context is: What information or what degree of detail must be conveyed in order to make facilitate a good discussion? The demand of the NGO representatives that minority positions should also be made public by expert bodies, may make necessary a discussion about specific details which the “informed citizen frequently can no longer understand as these facts are often highly complex” was one comment from an industry representative. Overall, stakeholder dialogues are deemed to be positive by the representatives of industry, NGOs and public authorities.

The industry representatives in particular wished to see a better structuring and follow up of stakeholder dialogues as otherwise they are reduced to end in themselves and were doomed to failure. “I think that the dialogue alone is not sufficient; it must also be followed up and structured,” said one industry representative. Another participant from the same group voiced the demand, “The dialogue must be more or less targeted and also limited in terms of scale and perhaps time in order to ensure that one has a certain success or failure experience and it doesn’t exist for itself”.

ORIGINAL SOUND INDUSTRY
“Things like that [stakeholder dialogues] are taking place more and more. For me that’s what good communication is all about.”

The industry representatives criticised the **choice of participants or the right contacts** when it came to staging stakeholder dialogues. In particular public authorities would frequently send representatives from the lower levels of the hierarchy who had no decision-making powers to corresponding events, “…what we notice again and again is that we are sent representatives from the second (that would already be good) or the third or fourth hierarchy level to events but what we need are the people who actually take the decisions. They are the ones who should get the information. They are the ones we want to enter into a dialogue with. That is the only way of getting approval for what we need. What is the point when a representative from the fourth hierarchy level takes part? He has to go back and explain it all to his superior […]. We need the right contacts”, was a criticism voiced by one industry representative.

ORIGINAL SOUND INDUSTRY
“That means that for specific procedures we need a mediator. This could be a platform or even an institution or person accepted by both sides.”

Furthermore, the industry representatives are very conscious of the fact that if they assume an overly active role in stakeholder dialogues, this can indeed be viewed critically by the other stakeholder groups. Given their lack of credibility, at least this was the perception amongst the public at large, it was also viewed critically when industry took part in a dialogue of this kind as an initiator or co-initiator. The credibility of industry was in any case generally very low even when the facts were undisputed. That’s the reason one industry representative called for a **mediator role;** this could be a person, an independent institution or even an institutionalised platform. In numerous cases this had already proved to be a positive experience which meant that this is now part of the “received wisdom” when conducting dialogues. That was the opinion of one industry representative.

Table 18 gives an overview of all the main components mentioned in the focus groups which are necessary for successful risk communication.

Table 18: Components of good risk communication

... For public authorities	...For Environmental and consumer associations (NGOs)	...For professional associations/ industry
• More transparency • Early involvement of all stakeholders • Openness about problem awareness and solution options for NGOs = genuine, true involvement • Clear framework conditions and feasibility or success criteria for stakeholder dialogue • Comprehensible depiction for the public at large • Clarity/transparency of goals • Systematic coordination of expert areas between external exchange of knowledge and coordinated communication towards the outside • Clarity about who is responsible for risk communication • No coerced consensus but transparency about differing opinions • Involvement on an interim level in order to bridge different uses of language and find a common vocabulary	• Timely, full information on risks • Timely "real" involvement of stakeholders "for the sake of involvement" • Wish for upstream information from public authorities before topic goes public • Faster assessment of risks after they emerge • Ranking of the most important risks/dangers • Good cooperation via informal channels, in this context increasingly active information • Greater transparency in processes and publications • Public meetings of expert bodies • More expert hearings with the involvement of NGOs and associations • Consensus about risk assessment criteria • More consideration of best practice experience from other countries	• Build on the sound foundation for factual and specialist assessment • Timely stakeholder dialogue with a view to giving the consumer uniform information • Structuring, follow up, targeted nature and defined timeline for stakeholder dialogues • Consensus-oriented dialogues (round tables, consensus platforms, government committees) • Timely involvement of counter-arguments, subjective risk perception etc. • Introduction of a mediator role (person/institution/platform) • Wish to public authorities: more advice along the lines of dialogue-oriented solutions • Wish to the public authorities: participation of decision-makers in the dialogue instead of lower hierarchical levels • Dismantling of initial reservations and prejudices between stakeholders.

4.3 Discussion of the results

The research project initially focussed on reconstructing the understanding and practical use of the terms "risk" and "hazard" in risk communication from the angle of public authorities, NGOs, associations and industry. The study was based on a toxicological understanding of the two terms whereby hazard describes the properties of the risk trigger. These properties are specified with the help of an examination of the dose-response relationships. Risk, in contrast, is deemed to be the product of the scale and probable occurrence of damage on the basis of exposure data (BfR 2005; EU 1994; EU 2002).

Both terms play a key role in risk assessment and risk management. Firstly, these terms are the decisive factor for the methodological approach to and implementation of risk assessment. Hence, risk assessment is preceded by an analysis of hazard identification. Secondly, they steer the actions of the decision makers involved by orienting measures in individual cases more towards the hazard or the risk aspect.

At first glance the distinction is clear and plausible; each risk trigger has a certain potential that can be dangerous (hazard) but it depends on the situation or context whether this potential really results in damage or not. If one combines the two situations, this is called a risk. Particularly in respect of the term risk, it was already pointed out early on that the two attributes probability and damage – and particularly their relationship – can be interpreted in dif-

ferent ways (Jungermann/Slovic 1993: 169ff; Luhmann 1990). Jungermann/Slovic note six different relationship patterns between the two attributes alone. Furthermore, understanding differs from scientific discipline to scientific discipline. The German Advisory Council on the Environment (SRU 1999) has clearly identified risk terms in a special report (technical, legal, toxicological, economic and sociological risk terms).

But is there more behind these two terms than there is behind the distinction between potential and real damage? What problem dimensions are we dealing with when experts and stakeholders refer in risk communication to these terms or do not do so? In order to explain and interpret the empirical findings, we distinguish between four different areas so as to ask the question: Does the different understanding and use of the terms constitute a semantic, conceptual, strategic or control-specific problem?

Initially it could be a purely **semantic problem**: different groups use words like hazard, risk, damage, damage potential, disasters – and basically mean the same thing but use different terms. In principle, this is nothing other than a problem of understanding. There is an assumption that there is a problem of understanding between the stakeholders involved in the communication process because of the, in some cases, differing semantic interpretation and discipline-related socialisation (for instance toxicologist, food chemist or epidemiologist). Then there is the context in which the terms are used. Whereas amongst representatives of public authorities there is, for the most part, a coherent understanding of the terms related to the toxicological definition, this is in some cases different for NGOs and industry representatives. Either there is no differentiated consideration of the terms or their meanings have been swapped. This was confirmed by the questions asked about the definition characteristics of the two terms in the interviews. An unclear or diametrical understanding of the two terms can be assumed to be widespread. Furthermore, the terms risk and hazard compete with a number of other terms like danger, threat, damage in its diverse forms (e.g. relative, appropriate, abstract, concrete). This semantic multi-interpretability can also be attributed to the influence of other contexts of use, for instance, legal, epidemiological or economic. For public authority risk communication this means disclosing their own definitions of the term behind the discipline-based origin and guaranteeing understanding of these definitions by stakeholder groups. This means taking their reference base (biological, physical, social impact) into account. It should also be examined whether the term hazard potential used in German (pleonasm) can be replaced by the term hazard.

Secondly, the different understanding and use by public authorities and stakeholders may be the expression of a **conceptual problem** (Renn 1992; IRGC 2006; Wiedemann, P./Schütz, P. 2006). Behind these two terms hazard and risk there is a highly specific risk concept which stipulates that hazard must be weighted with exposure. This means that hazard is qualified: only when the hazard is truly effective (i.e. can be empirically proven as exposure), is it significant within the meaning of a risk. If the stakeholders orient themselves more towards the precautionary principle, then this concept is rejected in terms of directing action. Then this is not a problem of understanding but a problem of fundamentally different or competing risk concepts in social groups (problem of understanding).

The empirical results of the interviews and the focus groups indicate that there are very different ideas of risk in the three groups of stakeholders examined, i.e. there are different risk concepts. This was shown by the survey of the risk assessment aspects in the three stakeholder groups. In the case of public authorities the decisive criteria are spread of the danger, probability of damage and permanent nature of exposure. In the case of risk assessment by professional associations and companies, damage and benefit aspects as well as the scale of damage/benefits clearly play a major role whereas for NGOs the criteria regulation of the risk and perception of the risk by stakeholders are decisive for their own risk assessment. In a nutshell: whereas public authorities pay considerable attention to the level and scale of

damage, industry tends to weigh up more the damage and benefit aspects. By contrast, NGOs include aspects of subjective risk perception to a greater degree in their risk assessment. They mask different risk acceptance thresholds. They contribute to the point onwards when something is classified as a significant risk or a hazard requiring regulation. Secondly these acceptance thresholds are likely to have an impact on the selection of risk topics (hazard identification).
Different perceptions of risk do seem to entail major explanatory potential for stakeholder-specific risk concepts, particularly for NGOs. For instance public authorities claimed that environmental and consumer protection associations classify each and every hazard as a high risk whilst ignoring the factor, probable occurrence. Hence NGOs orient themselves more towards the hazard aspect than the actual risks. The NGOs confirmed the major importance of subjective risk perception for their understanding of risk. For risk assessment and management there is the challenge of disclosing and making the conceptual background and contributing factors transparent by using a concrete example and establishing its link to the aspects of competing risk concepts.

In the political opinion-shaping process about dealing with hazards/risks, this may also be a **strategic problem.** A strategic orientation means that certain terms must fulfil certain goals within a discussion. For risk communication different strategic options were presented (Karger 1995). In this context various strategies can be identified with the goal of changing attitudes, solving conflicts or influencing decisions. These terms are then instrumentalised on behalf of (special) interests. The underlying problem here is of contradictory interests. This strategic problem raises the question about how to deal with these different strategies.

All stakeholders are deemed to be motivated in their actions to protect man and his environment. However clear reference was made to the existence of special stakeholder-specific interests. In the case of public authorities it's about raising their profile vis a vis other state institutions, proof of political or state action competence or the legitimation of political measures. In the case of NGOs the motives are securing the loyalty of and attracting members, the mobilisation of financial resources and a strong media orientation; whereas industry stakeholders mainly have economic interests for the avoidance of economic damage.

The location in the risk communication process and the different competence profiles likewise have an indirect influence on the strategic positioning of the stakeholders involved. Public authorities bear their executive responsibility in many risk areas for all phases of dealing with risks. These phases encompass identification, assessment, management and communication of hazard/risk whereas industry sees itself as being responsible for risk management during the production and distribution of its products (product responsibility) and for communicating product-specific expert knowledge to public authorities. Environmental and consumer associations are mainly attributed communication and control responsibilities (control first and foremost along the lines of control of control). This leads to by no means insignificant strategic differences in terms of the attributibility of risks and the assignment of responsibility for them.

The role of the media as a strategic influencing factor must be clearly stressed. According to many experts the media determined to a major degree (above all popular press and TV) which risk topics are noticed by the public at large and whether they have a positive or negative image. Correct, transparent risk communication "against" the media was scarcely possible. Furthermore, it is noted that the media are instrumentalised by the different groups of stakeholders in respect of their specific interests in the risk discussion.

Overall, it can be observed that there is major "instrumentalisation mistrust" between the stakeholders. A key objective for future successful risk communication in Germany is, therefore, the establishment of (institutionalised) forms of behaviour, which can help to gradually

dismantle this huge instrumentalisation mistrust without questioning the right to existence of contradictory interests in a pluralistic society.

Finally, there may also be a **control problem** as the use of these terms has very specific implications for the orientation of risk management. In the case of an orientation towards the hazard aspect the proposed measures will mainly start with the risk agent or trigger. If the orientation is mainly towards the probability of occurrence and level of damage, then the management measures will start more with the exposure side. However, the identification of the hazard and risk is not always clear when it comes to selecting the control approach.

In the case of the question about *hazard determination*, the decisive factor is what guidance parameter(s) is (are) selected for the damage. Is it about protecting human life, maintaining certain health standards, protecting biotopes, maintaining biodiversity, purity of water and air, or making a contribution to sustainable development? When it comes to the question about damage, the question must always be answered about the point of reference (health, environment, wellness) and about the protection goal (example: contaminant-free water, low level contaminated water, contaminated water below the threshold of an acute health hazard etc). Amongst the public at large there is often a feeling of irritation because the term “limit value” or “standard” is seen as the demarcation line between safe and unsafe or between healthy and unhealthy.

In contrast to the measurement of damage, the *determination of the risks* is tied to the modelling of dissemination pathways, exposure, intake (reception) and the triggering of damage (Hauptmanns *et al*. 1987). In this context calculating the probable occurrence is a complex and multi-interpretational endeavour (Tittes 1986; Hauptmanns 1997; Kaplan/Garrik 1993). The term “probable occurrence” is used for events or negative consequences that do not occur regularly or cyclically but where earlier observation data, logical links or merely presumptions about the relative frequency of the events over the course of time are available. These estimations of probabilities always come with a certain degree of uncertainty (Klinke/Renn 2002).

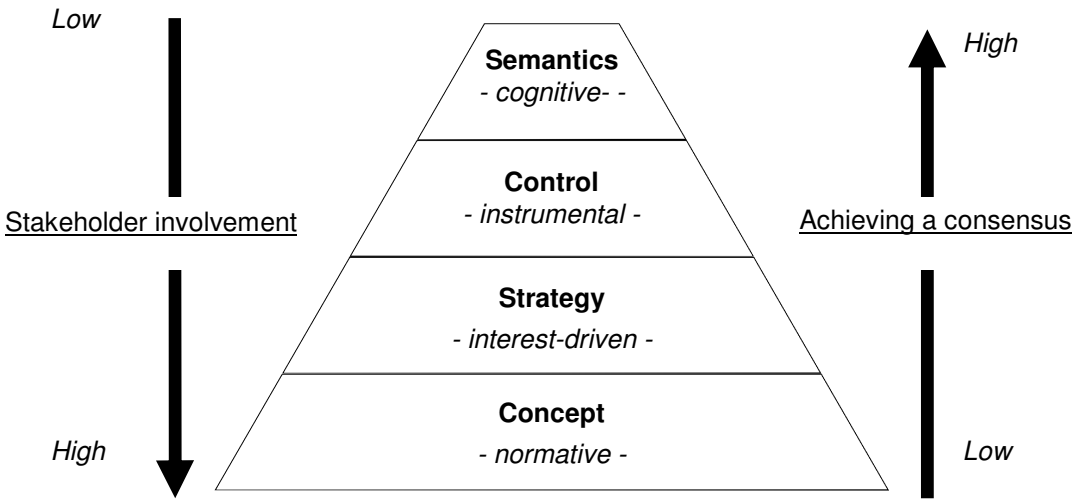
The uncertainties in determining the hazard and the risk provide space for stakeholder-specific differences about the regulatory approach to be adopted. In the case of a concrete risk or hazard, conceptual and strategic differences about how to handle the risk can escalate into a control problem. Our conclusion: if there is rather low risk acceptance, then attention will focus more on measures to reduce the hazard. If the main focus is on weighing up damage and benefit aspects, which means that the threshold of tolerable risk is set higher, then attention will focus rather on measures on the exposure side (precautionary principle vs. danger prevention).

In order to identify the scope of the control problem, it is necessary to examine within the risk management process the action options regarding their stakeholder-specific conceptual or strategic orientation and the specific characteristics of a control object, and to disclose them to all the stakeholders. Based on the phases of risk management suggested by IRGC (2006: 43), this should be done whilst taking into account transparency and participation within the framework of option assessment and option evaluation and selection.

Conclusion: the results show that when it comes to the terms “risk” and “hazard” there are several problem dimensions. These problem dimensions can be broken down analytically into a semantic, conceptual, strategic and control-driven dimension. Fig. 14 depicts this as a pyramid in which the individual dimensions build on one another. The individual dimensions are set against different levels. In the case of semantic questions, the cognitive level is involved – for instance tthe understanding of the terms risk and hazard potential must be interpreted in a multidisciplinary manner. In the case of control problems differing attitudes

amongst the stakeholders are noticeable above all when it comes to the regulatory approach and instruments. In the case of these two problem situations the opportunities for achieving a consensus amongst the stakeholders are still relatively high, the need for comprehensive participatory negotiating processes is relatively low – when stakeholders do not link this with any strategic (interest-driven) or conceptual (normative) questions for which it is far more difficult to achieve a consensus.

14: "Pyramid model" – Explanatory dimensions for different attitudes amongst risk communication stakeholders



Source: own depiction

5 Action recommendations

One central task of the project “Communication of Risk and Hazard” was the development of action recommendations to improve risk communication. It was shown that the different definitions and the different understanding of the terms “risk” and “hazard” had scarcely been discussed in the literature so far and was not deemed to be a central obstacle to communication by the experts who took part in the interviews and focus groups. The action recommendations elaborated in the course of the project are presented below. In the second part they are compiled into four central action areas. For each action area three concrete measures are proposed. In the last part various participatory methods for risk assessment are presented as an excursus.

5.1 Compilation of action recommendations

In the various phases of the projects – literature analysis, empirical evaluation and final colloquium – a large number of action recommendations are compiled which are systematised here. First of all there is an overview-like compilation of action recommendations that result from the literature, the results of the empirical studies and the final colloquium. In order to be able to identify the origin of the measures, this was initially done by literature analysis, empirical evaluation and a final colloquium. They are then compiled into four meta themes and presented with proposals for concrete measures and their implementation options.

Compilation of action recommendations from the literature
In the literature analysis, which covers the areas communication of “risk” and “hazard” by institutions, stakeholders in risk communication with public authorities, risk perception, communication models, strategies and procedures, problems of risk communication as well as successful risk communication and implementation aids, a series of action recommendations were identified which have been systematically compiled:

The “risk” and “hazard” concepts in consumer communication

- The communication of **risks** is more difficult in consumer communication than the communication of hazards. Besides the damage potential the consumer must also process additional information like probable occurrence and exposure. For that reason **two-way communication** is more suitable for the communication of risks as it offers the possibility of feedback from the consumer. In concrete terms this means for risk communication selecting communication strategies with the feedback option e.g.: in the form of public events, timely hearings of stakeholders, mediation, fora, panels, exhibitions as well written material or the Internet if they offer the information feedback option. This doesn’t just apply to communication with consumers but **also to communication with stakeholders.** In many cases there is, however, already two-way communication (through round tables, expert meetings and committees, expert hearings and negotiations with important social, nationwide groups).
- In the communication of **hazards** the differing nature of the damage (e.g. it may be ongoing or concrete, number of injured or dead or involve a specific unit of measurement) may confuse consumers. Hence the laying down of a **guidance size**, a **protection good** or a **protection goal** is recommended in order to illustrate the hazard. One example of a protection goal could be the inviolability of nature or of human life.

Preconditions for successful risk communication

- For successful risk communication it is important to be clear beforehand about the task and the goals of communication. Depending on the goal a different strategy may make sense in communication. A distinction can be made between three general goals of risk communication: a change in the attitude to the risk, influencing of decisions and the solving of existing conflicts. The choice of communication strategy depends on the respective goal. It maybe oriented towards signal effects, information, credibility, weighing up of benefits or cooperation (cf. Chapter 3.1.4). This applies not only to communication with the public at large but also to communication with the various stakeholders.
- Besides clarifying the goals and strategies, the most important preconditions for successful risk communication and the foundation for every element of communication listed in the literature are **trust building, transparency and credibility**. To establish them, there is a need for a timely involvement of stakeholders and the public at large as legitimate partners. The people who are responsible for communication must have the following qualities empathy, expertise, honesty and commitment, i.e. skills that can only partially be acquired and which must play a role when selecting people. In the literature the timely use of participation processes like e.g. preventive citizen fora held prior to the occurrence of damage was mentioned as a concrete approach to building trust and establishing transparency.
- The **communication form** is deemed to be as important as the communication content. This refers both to the choice of the communication strategy and the process, and to the communication expertise of the communicator.

Target group-oriented risk communication

- Based on the central problems of risk communication identified in the literature – specific misinterpretations within the framework of information presentation, the influence of contextual and world view determinants on risk judgements both amongst experts and laypersons and a lack of clarity in the understanding and use of terminology – it is important to fall back on **target group-oriented communication strategies** which reflect the level of knowledge and interest of the respective receivers. For target group-information processing of this kind, a *better understanding or more precise knowledge* of the respective receivers is essential.
- This includes the concrete translation of risk messages into various "**stakeholders' languages**". The central challenge here is to correctly transport the factual contents in such a way that they are nevertheless understood by the respective receivers. This applies both to communication strategies and procedures and above all to their contents. In concrete terms this can be done through the illustration of risk messages and simple examples from the respective environment and world view environment of the target groups. In this context consideration must be given to the differentiating nature of the target groups (and of minorities), which may also include for instance socio-economic or personal characteristics (e.g. gender, age group, income, parenthood etc.). A distinction between the two concepts risk and hazard plays a rather subordinate role and can be illustrated if necessary through additional information like dose, exposure and contamination circumstances.
- **Risk comparisons** may be helpful for target group-specific risk communication when they are drawn from the experiences of the respective receivers. For the purposes of understanding it should, however, be ensured that identical unit measurements are used and that there is a similar level of data reliability. Furthermore, the intention must be made clear (no decision on acceptability as the comparative risk is accepted but rather merely depiction). Otherwise, risk comparisons can quickly be accused of seeking to mislead people or play things down.

Compilation of the action recommendations from empirical results
The key action recommendations from the empirical analysis of the expert interviews and focus groups are presented in detail in the respective sections on results (cf. Chapter 4.1.4 and Chapter 4.2.3). The following points for both parts can be summed up as common central action recommendations:

- The creation of greater **transparency**, in particular in the public authority processes and in the commissioning and financing of scientific studies are seen in particular by NGOs and associations as being central tasks of public authority risk communication. Overall **public authorities** are assigned central responsibility for risk communication. However, there is an expectation that NGOs, associations, industry and the media are sufficiently and proactively integrated.
- **Systematics** and **regularity** are important for stakeholder involvement.
- The creation of greater external **openness** in risk communication i.e. the coordination of statements by public authority representatives and timely *internal* (intra- and inter-public authority) *exchange of information* in order to establish a comparable level of knowledge amongst public authority representatives, which makes possible this coordination.
- The building of **(risk) communication skills** by *training sessions,* etc. for the responsible public authority representatives.
- In risk communication, particularly with the public at large, the **distinction between "risk" and "hazard" is not very helpful** as the two concepts are very difficult to translate into everyday understanding. A *target group-oriented language* is in most cases more likely to contribute to the success of risk communication than communication of the difference between the two concepts. A detailed critical assessment with the respective target group is another important contributory criterion to success in the systematic planning of communication strategies.
- **Successful communication examples** are characterised by a high degree of *method diversity, creativity and imagination.* There are no general solutions that can be applied to all risks. **Two-way communication** with an open, transparent flow of information is however, expected as a rule by the stakeholders involved.

Compilation of the action recommendations from the final colloquium
For the further processing of action recommendations for public authority risk communication, the results from the literature and empirical evaluation were presented during the final colloquium on the client's premises (BfR) in Berlin to almost 100 experts. During the panel discussion and a World Café, the results and action recommendations were discussed and supplemented by additional proposals.

Within the framework of the World Café the participants were asked to discuss two questions and to record the results:

1. How can the respective state institutions implement the project findings on the theme of risk/hazard in their communication work?
2. How can the respective state institutions involve experts from politics, industry and NGOs more effectively in risk assessment and communication?

The following action recommendations can be derived from the documentation on this interactive exchange between the workshop participants. They are presented in Table 19 by theme area:

Stakeholder dialogue on risk assessment and risk management

- Create structures and platforms, institutions and a communication infrastructure
- Structuring of communication: set up communication fora between public authorities and stakeholders and use permanent networks for a regular exchange; tasks: develop action recommendations (depending on the degree of freedom), where appropriate with partial funding, financing of studies, websites, information material
- Possible topics for these platforms: certain food groups, substance groups, ingredients, problem areas, pathogens
- Structuring of the process: a) risk demarcation/question, b) ranking of risk assessments, c) central coordination and information
- Training of scientific staff in public authorities to improve their communication skills.
- Create opportunities for feedback; NGOs and industry should be involved in risk assessment (based on the OECD model); however confidential information confronts us with the boundaries
- Promote cooperation: early timing of participation, appropriate form of participation, clarity about goals of participation (information of public authority or information of all stakeholders? Discussion/deliberation? Participation in decisions? Use of discretion, coordinated discourse)
- Transparency, credibility, trust, objectivity, honesty; get rid of emotion and polemics; show backbone
- Clear decision who is involved; representatives of stakeholders are not always experts, hence access to expert knowledge for all stakeholders

Concrete measures:

- In risk assessment: committee for hazardous substances; expert bodies (with participants from industry, trade unions, science, public authorities) who then make recommendations for labelling, assessment and approval; however there are no committees for consumer protection
- Idea: advisory bodies for consumer risks with tasks: problem framing, acceptance of methods, getting people on board for a common strategy along the lines of uniform, closed statements
- Examples: expert talks Stiftung Warentest; create topic platforms like e.g. washing forum or use these platforms
- Round table with stakeholders on the factual level

Adapt contents of risk and hazard to target groups;

- Target group orientation of communication
- Use of information from the consumer hotline etc.
- Communicate clear action instructions
- Linguistic translation of the assessment of results for third parties

Public authority communication of risks
- Transparency and openness of advisory bodies, plausibility of decisions
- Render history and positions transparent; disclose decision-making processes and assessment (foundations), clarify responsibilities
- Lower hurdles for information access, make data and facts accessible
- Establish and apply guiding principles
- Stage round tables (on the administrative assistant level)
- Involve all factual levels
- Use new media more proactively (Internet)
- Set up databases with different access rights

Handling risks:
- Introduce or repeal laws
- Need for a pan-social accepted risk level for all risk areas (e.g. via an ethics committee)
- Elaboration of methods that steer the risk assessment process
- Publication of facts, for x action options: deadlines, comparison with social norms → individual implementation of risk management
- In addition, further action recommendations were made within the framework of the panel discussion and contributions to the event:
- Improved coordination of the various federal levels, e.g. in conjunction with the implementation of the European Chemical directive REACH would be desirable
- Correct, complete information as the basis for credibility and, by extension, the precondition for successful risk communication
- Staff training (concerning expertise, ability to communicate and handling the media) is a precondition for target group-oriented information.
- The separation of risk assessment from risk management is not deemed to be helpful by all public authority representatives, quite the contrary. In the case of phthalates this led to inconsistencies between the recommendations of the public authorities based on the precautionary principle and ongoing support for existing EU standards amongst association representatives. On the other hand, the separation of risk assessment from risk management was necessary in order to achieve transparency. A transparent depiction of the path leading to a decision by a public authority was needed.
- A linking of risk assessment with management was particularly necessary when having to deal with uncertainties. In this case action pathways must have already been identified although the risk assessment wasn't concluded at that point.
- The communication of uncertainties can only be done through transparency. If the risk assessment has not yet been completed, the various open positions must be presented.
- A demand for legal certainty in European Legislation was voiced. Here there was a lack of clarity about safeguard clauses, which enable public authorities to examine or change directives. To ensure the independence of risk assessment a call is made for greater transparency and non-intervention.
- Demand for as high a degree of independence as possible for public authorities from political influence. One example given is the Food Standards Agency (FSA), which is responsible to parliament only. In Germany there is said to be an asymmetrical dimension to

information between industry and the public authorities on the one hand and the population on the other.

By way of summary, the following points were identified as being particularly important at the end of the event:

- The risk perception of the public at large must already be taken into account in risk assessment. To this end suitable measures must be developed and applied.
- The timely and genuine involvement of stakeholders (NGOs, associations, industry) plays a central role in risk assessment. Depending on the goal, the corresponding participation strategies must be selected.
- There are certain limitations – like the political separation of risk assessment from risk management – which peg out the possibilities of risk communication.
- Before risk communication measures are taken, irrespective of whether they accompany risk assessment or risk management, it is important to define the target group and to base the measures thereon.
- Risk comparisons from the environment and experience of target groups can be helpful when it comes to illustrating unfamiliar risks.
- Transparency in risk assessment processes (within and between public authorities) and within the framework of communication strategies are important contributory factors to successful communication based on trust and credibility.
- Proactive action is better than reacting to damage that has already occurred.
- Coordinated dissent can be as much a goal of stakeholder participation as achieving a consensus.
- The goal is to take this to the European level.

5.2 Action areas and measures

From the numerous individual project findings (literature, empirical evaluation, colloquium), four general action areas were developed which are called the **“four pillars of risk communication”**. These four topics have been compiled as an overview in Table 19. The action areas are then explained, and for each action area three concrete measure packages are proposed for improving public authority risk communication. The potential measures are oriented firstly towards implementation options against the backdrop of the status quo (“conservative”), and secondly efforts were made to elaborate innovative, further reaching proposals for measures.

Table 19: Four pillars of risk communication

Topic	Goal	Empirical substantiation	Possible measures
1. Build skills	• Build skills on risk and hazard in stakeholders involved in assessment and management	• Different risk concepts • Target group-oriented communication	• Communication training • Mutual coaching of public authorities and stakeholders • Building a risk and hazard competence network with all stakeholders and public authorities • Build up a database of active and passive stakeholders, attribute names and institutions to the types of risk
2. Orient towards target group	• Adapt contents of communication on risk and hazard to target groups	• Different perception and information processing by target groups • Different disciplines	• Use concrete examples to illustrate BfR working definitions of risk and hazard • Use simple images/metaphors • Real two-way communication: with an analysis of target groups and integration of feedback loops
3. Transparency and coordination	• Transparent and coordinated communication by public authority institutions • Establish trust, credibility	• Lack of coordination within and between public authorities on the *Land* and federal level • Dissemination of different, inconsistent communication contents on similar topics from public authority institutions at the same time • Differing needs for information/contents in the case of the target groups • Frequently late, non-transparent communication by public authorities • Not enough cooperation between NGOs, public authorities and industry on concrete cases	• Speak with one voice • Two-way communication with feedback • Active communication with the public at large
4. Take concepts into account	• Accept and consider different risk concepts when dealing with risks	• Multidisciplinarity • Different risk perception by stakeholders and public authorities • Target group-specific or interest-oriented communication	• Risk assessment and stakeholders: integration into the procedure of BfR risk assessment (BfR guide) • Setting up of a body “social handling of risks” • Pilot projects in concrete risk areas with participation of stakeholders and people affected

Action area 1: Build skills
The results of the study have shown that a lack of communication skills and a lack of competence when dealing with knowledge and risks can lead to or amplify risk communication problems. For that reason one of the four "elements of improved risk communication" is the **building of (communication) skills** of the stakeholders involved in risk communication.

This applies above all to public authority risk communication as it has been shown that public authorities, in particular BfR (per its statutory remit) and the respective federal authorities are attributed central responsibility by the other stakeholders for the success of risk communication. Hence, there are expectations that public authorities will initiate risk communication measures and make relevant information available to the stakeholders and the public at large. At the same time, another central task of public authorities is deemed to be involving the stakeholders in a proactive and timely manner in the risk assessment and risk communication process. This means that both within public authorities as well as in cooperation with stakeholders there is a need for a high level of technical expertise for risk assessment, i.e. expertise in the respective risk areas and for risk communication, i.e. genuine communication skills. These skills are needed to facilitate firstly understanding despite competing risk concepts and secondly target group-oriented communication.

"The skill-building" measures must aim to sustainably improve the communication skills of the stakeholders responsible for risk communication, particularly in public authorities, and to improve the expertise of all those involved in the communication process. This will enable the stakeholders to assume an active role in the risk assessment process.

(1) Communication training
This rather *conservative* measure aims to strengthen the communication skills in particular of public authority representatives and the support them in their risk communication tasks. The training courses should be staged by external communication experts.

The *content* of the training courses should focus on the following:
- Raising awareness of divergent risk perception between experts and laypersons, i.e. introduction to the level of research on risk perception, also to the desirable and undesirable effects of communication
- Use of different communication strategies depending on individual goals (inform, change attitudes, influence decisions, solve conflicts, cf. Karger 1995)
- Preconditions for the sensible use of risk comparisons and illustrations.

One way of doing this is to simulate risk communication situations in the form of simulations or role play.

Communication training courses have already been successfully staged for instance at BfR and also in *Länder* authorities. In order to sustainably improve communication skills, regular systematic further training is of major importance. The foundations for communication training are then conveyed during the course. After the training, practical advice/supervision could be offered at regular intervals in order to look at special cases in the everyday work situation of public authorities. What is important is a demarcation between risk and crisis communication as well as a possible breakdown into individual training units for communication with specific target groups and in-depth consideration of their needs.

(2) Mutual coaching of public authorities and stakeholders
This rather *innovative* measure focuses on the mutual building of communication skills by public authorities and stakeholders. In intensive, short-term cooperation it identifies the respective communication needs, requirements and constraints of the other groups of stake-

holders in a direct exchange. To this end, the representatives of the stakeholders responsible for risk communication could for instance “spend” a limited period (e.g. 2-3 days) as guests in the corresponding public authorities and in this way initiate a mutual exchange about the everyday communication situation of the respective other party. Vice versa public authority representatives could spend time with NGOs or industrial plants, experience their daily communication situation and participate in a project there. Through better understanding of the daily requirements and the creation of informal contacts, undesirable communication consequences and obstacles can be dismantled.

(3) Building up a competence network “risk and hazard” with all involved stakeholders from industry and civil society as well as all public authorities involved in risk management
This rather *conservative* measure aims to generate a uniform, more competent level of knowledge in all the stakeholder groups involved in risk assessment and communication, i.e. stakeholders and public authority representatives. A competence network of this kind should impart knowledge in a targeted manner and bring together in subgroups the stakeholders involved in a specific type of risk. The basis for this is the creation of a database of active and passive stakeholders whose names and institutions are attributed to the respective types of risks. Regular meetings between members of the network and subgroups are the goal. The subgroups should be oriented toward the BfR theme areas and could be sensibly composed in terms of the desired or viable number of participants for a specific theme.

Programme contents could be planned for meetings of the overall network and for the respective theme-based subgroups.

The following overarching topics could be conceivable for the overall network:

- Training courses on risk communication like in measure proposal 1 – here with the involvement of the stakeholders
- Expert inputs on risk perception, risk cost concepts and definitions, risk control on national and European/international level, dealing with scientific uncertainty
- Possibility of discussions and mutual exchanges as well as the generation of ideas by dialogue-based methods like group work, World Café, chaired discussions etc.

For the theme-based subgroups the focus would be more on the exchange of expertise. They could address their attention to the following main points:

- Input of concrete questions or situations requiring explanation by the different participants (groups)
- Input of network partners or external experts on the depiction or enlargement of the level of knowledge with the possibility of feedback and additional questions (two-way communication)
- Possibility of theme-related discussions and mutual exchange and generation of implementation ideas by dialogue-based methods like group work, World Café, chaired discussions etc.

Action area 2: Adaptation of risk communication to target groups
The evaluation of literature and empirical findings reveals that the world views of the stakeholders shape the specific perception of risks and hazards. Different roles – like profit-oriented businessmen, risk avoidance officers, controllers and spokespersons – lead to differing interpretations of the same risk situation.

Besides the differences in perception for each group of stakeholders, the literature and the empirical evaluation provide insight into the different handling of risks and hazards by various

scientific disciplines. For example, a comparison of the definitions of the terms risk and hazard of various national and international institutions reveals differences in content that can be attributed to the discipline background of the organisation. The focus groups confirm this barrier to understanding caused by the different disciplines. This is due to a lack of interdisciplinary exchange on terminology and concepts.

The following general demand can be derived from the multicausal (stakeholder role, cognitive processing, disciplinary ivory tower etc) differences identified in the perception and interpretation of risks and hazards. The content and form of successful risk communication must be oriented towards the respective target group. The following three packages of measures described below can help to adapt the communication of risks and hazards to the specificities and requirements of the respective target groups. The first package is a rather conservative approach whereas the two others are more innovative in nature.

(1) Illustration of the BfR working definitions of risk and hazard
The BfR working definitions of the terms risk and hazard are based on statutory provisions and a toxicological understanding of the terms. This understanding forms the (Europe-wide) statutory foundation for the conduct of risk assessments of concrete materials, substances and food. This research project confirmed that the stakeholders have differing risk concepts that also reveal different attitudes towards the terms risk and hazard. Against this background it is recommended that the statutory definition of terms should be presented more clearly in the discussions with the groups involved in risk communication and illustrated using concrete case studies. For instance BfR could give a short risk and hazard assessment in its regular opinions on individual products, materials and substances. The different usage of the terms could be depicted using concrete examples and, in this way, generate better understanding of these terms amongst the groups involved.

(2) Establishment of target group-specific two-way communication
Efforts to adapt the forms and contents of risk communication to the respective target groups are dependent on an extensive examination of the communication process itself, the specific communication context and the various receiver groups. The risk communicator must be clear upstream of his goals, his strategies and his target groups. The latter must be broken down into stakeholder groups like companies, associations, media and consumers or the general public. The exact determination and demarcation of target groups can be done by means of political and sociological studies. Public authority communication with both the stakeholders and the public at large really must be two-way. This gets the target group involved in the communication process, facilitates genuine understanding on the receiver side by additional questions and takes note of the feedback from the target group as a source of important information about the target group itself and for its own work. The key element in two-way communication is the establishment of feedback loops. In terms of organisation, target group-specific loop-based risk communication will be guaranteed by the risk communication department within BfR that deals with communication with the respective target groups and processes communication of the risk message to ensure that the form and content suit the target group. In this context, the department acts as the translation unit between expert risk assessment and the perspectives of the individual stakeholder groups and groups in the population. Similar to foreign language translators the BfR staff members specialise in translation into specific “stakeholder languages”. Communication feedback from the target group takes the communication full cycle and generates new target group-specific risk messages from BfR. At the same time, they’re taken over into the ongoing process of target group characterisation and help to evaluate its own communication efforts.

(3) New paths for communicating with the population at large
As risk communication for the population at large is particularly difficult because of its specific risk perception, its cognitive processing limits and media distortions of the risk message and as informed citizens can, in many cases, largely control their exposure to the risk source, BfR should pay special attention to successful communication with laypersons. It should provide – with varying degrees of detail – insight into risk associations so that citizens can engage in self-determined handling of the risk course in line with their specific risk tolerance threshold. The traditional information tools of BfR like publications of reports in paper form or on its website, press releases etc could be supplemented in this way. In order to achieve greater independence from the media and reach new target groups, a company could consider creating its own television channel – with multilingual subtitles – based on the model of the digital channels already operated by big companies. This can be flanked by a radio programme and a broadly based interactive information offering on the Internet which enables people to assume control over the desired information processing and depth and provides access to feedback, suggestions, questions and concerns. Furthermore, in the case for instance of product-related risks greater use of risk information positioned at the risk source itself could be considered in order to reach the population on a wider level. It is customary for information of this kind to already figure today on medicinal and tobacco products. Here, too, attention should be give to the target group-differentiated depiction of information by text, symbols or short audio messages. Recommendations as well as appropriate, carefully selected risk comparisons could be helpful for laypersons when it comes to forming their own opinions.

Action area 3: Transparency and coordination – public authority risk communication
Another result of the empirical evaluation is that a call was made for transparent, coordinated and target group-oriented communication by public authority institutions. Late or inconsistent information creates distrust of communicators, in this case the public authorities.

The main reasons given for this distrust by all participants and by representatives of the public authorities, NGOs and industry were:

- Lack of coordination within and between public authorities on the Land and federal levels,
- Distribution of different, inconsistent communication contents on similar topics by public authorities at the same time,
- Differing information/content needs amongst the target groups,
- In some cases, late and non-transparent communication by public authorities,
- Not enough cooperation between NGOs, public authorities and industry in concrete cases.

The following three measures aim to furnish ideas and concrete proposals about how public authority communication could be agreed upon, coordinated and rendered transparent and in this way, more positively received. In this context it will be important for the information service of the public authorities to be in demand and sought after. Individual measures will be less successful than when they are combined into a multi-phase programme, which extends from tackling crisis situations over preliminary assessment and risk assessment down to risk management.

(1) Speak with one voice
It happens again and again that an acute topic is picked up by the media. In this case the public authorities must act quickly and assess hazards and risks. In their external communication, a uniform and coordinated voice is, therefore, important. Given the large number of public authorities on the *Land* and federal levels, it is clear that this is not easy to coordinate. Different disciplines and internal public authority legal standards act as barriers to communication and slow down the coordination process. The following measures could help to remedy this situation:

Individual measure: Set up a crisis troubleshooting team within the public authorities (public authority-public authority communication)
If an **acute incident** occurs, the option could be to set up a cross-public authority crisis coordination team that collects at a central point the information from the public authorities, evaluates it **and** passes it on to public authorities and non-public institutions. Furthermore, the information should be accessible on a "public authority Intranet" and regularly updated.

This rapid action is, however, dependent on the prior creation of an infrastructure (Intranet, harmonisation of databases, contacts in the public authorities), precautionary planning and, above all, the prior testing of the coordination and communication structure. This could be done, for example, by simulating risk assessment and risk management in which an acute communication situation is played through similar to the exercise series LÜKEX (Cross-*Länder* Crisis Management Exercise) of the Academy for Crisis Management, Emergency planning and Civil Protection (AKNZ) of the Federal Office of Civil protection and Disaster Assistance (BBK) that tests the interaction between municipal, *Land* and federal authorities.

Individual measure: Launch round table of specialist authorities (public authority-public authority communication)
One rather long-term measure could be the setting up of a **round table of specialist public authorities** on individual topics which intervenes in the run-up to incidents and gets risk assessors and risk managers around the same table. The "round table" could consist of representatives of the various specialist authorities, which compare the different reference frameworks of the public authorities, analyse the risk assessment and identify precautionary solutions and acute actions to be taken. The results could again be presented on an Intranet of the public authorities in order to ensure the dissemination and use of the results.
A kick-off meeting would specify which topics were to be analysed, and then the corresponding round tables would be set up. The chairing of the tables could be decided internally by the public authority representatives and rotate every 6 months.

Individual measure: Establish thinking in one language and guidelines
Public authorities would like their communication to be intelligible, targeted, consistent and transparent. In this context public authorities are tied to the specific technical terms and language rules of their institutions. Here it would make sense to have a cross-public authority formulation of the most important terms, methods and linguistic rules. This would at least simplify work within a public authority. To this end, an Intranet like a kind of public authority wikipedia could be set up into which certain individuals input content and other representatives of the public authorities would then comment on and update. A glossary of terms would also give an overview.

Furthermore, the compilation of joint communication guidelines would facilitate coordinated communication between public authorities and increase their credibility.

(2) Two-way communication with feedback
Individual measure: Set up crisis troubleshooting team for public authorities, NGOs, consumers and people responsible for the crisis (public authority-stakeholder-consumer communication)
In comparison to the "conservative" option, a crisis troubleshooting team with representatives of public authorities, NGOs, industry and consumers could be set up in the **acute crisis situation**. This is because non-public authority institutions like consumer initiatives, Greenpeace, BUND etc. are the ones who communicate information and know what information is in demand. In addition, consumer representatives could provide information on the intelligibility, transparency and credibility of the planned communication. The interpretations and assessments of facts differ as well between various experts, consumers and public authorities. This means that prior coordination and choice of information by the troubleshooting team

would lead to fewer misunderstandings, enhanced understanding and greater credibility amongst the public at large.

The involvement of the people responsible for the crisis makes sense as they have the most information about the product, causes and consequences and can frequently help to take rapid action. To this end, a procedure should be set up which makes possible a “factual distance” and “future orientation of the solution” in communication with the people responsible. This means that they will not be condemned or pilloried for their behaviour. Nor will they be exonerated and their behaviour played down but rather the search for a solution will be placed centre stage.

Individual measure: Offer a “public authority-stakeholder-expert” forum
Communication with experts and non-public authority institutions is an alternative path to creating transparency in the assessment and communication of hazards and risks. The stakeholders are calling for more and more transparency which generally means that they want public authorities to reveal the path that led to their decision, what the assessment foundations were for the decision-making process, which studies and opinions they referred to, and who financed them, etc.

Communication fora of this kind between public authorities, stakeholders and experts should be staged as permanent networks with a regular exchange and always convened on specific issues raised by the stakeholders. The involvement of the stakeholders in the preliminary phase of assessment simplifies the process as timely involvement increases understanding and permits a comparison and acceptance of values.

In these fora the different attitudes and interpretations of assessment methods and situations can also be clarified. This does, however, imply a face-to-face event and not an exchange via the Internet or written communication in order to work on the conflict potential.

(3) Active communication with the public at large
Public perception is very dynamic. There are no direct contacts like there are for instance for stakeholders and the target group like children, mothers, people working in an industry, ordinary consumers is not always clear. The opinion-shaping process is very difficult to predict and often follows its own laws. The **proactive involvement** of the public, in addition to stakeholders and industry, in risk assessment and the related risk management is all the more important.

Individual measure: Participation procedure in risk assessment
If the public at large is affected by a risk-regulating measure, then they should also be involved in the decision-making and decision-taking process. What is needed for this is a concrete selection of the target group and direct approach. An open invitation will tend to attract people from the critical corner rather than offer a representative picture of what the population actually thinks.

The experts from the consumer advice bureaus, who communicate directly with consumers, could choose the topics. When there are signs of numerous telephone enquiries raising doubts about a product, the public authorities could react and put the topic on their agenda. Another option for risk topic screening could be focus groups, stakeholder dialogues or scientific committees. Expert consensus conferences or citizen dialogues seem to be suitable fora for risk assessment. For risk management round tables or mediations tend to be used more. Chapter 5.3 (Participation methods in risk assessment) offers a choice of methods depending on the goal.

Training for expert staff in public authorities which imparts skills for communicating with the public at large like empathy, listening and understanding as well as press communication would also help in the medium term to create more target group and understanding-oriented communication.

Individual measure: Service agency
Besides consumer initiatives and non-public institutions like Stiftung Warentest, thought could be given to creating a kind of service agency for communication with the public at large. This proposal was already put forward by the ad-hoc committee of the federal government on the harmonisation of risk standards. Besides processing the results of risk assessment, an agency of this kind would act as an overarching, accessible contact in cooperation with consumer initiatives and *Land* agencies for the public at large. To this end, it would be necessary to offer a kind of risk assessment hotline for direct contact with the consumers in addition to purely factual information on the website, press releases, guides and information material. This should be done in close coordination with the consumer advice bureaus in order to avoid duplication of the offering. For the consumers it will, however, be difficult to distinguish between risk assessment and management and an attached service agency, that covers both, would be more consumer-friendly.

Action area 4: "Take into account different risk concepts"
When it comes to the concrete handling of risks, numerous stakeholders are directly or indirectly involved. The central stakeholders are the scientists, regulatory organs/bodies, industry, civil society associations, NGOs, the general public and media. Once these diverse stakeholders have been identified, one thing must be borne in mind. The different stakeholders will have very different views on whether something is seen as a risk or a hazard. Risk or hazard is also a social construct where social, cultural, political, economic and other aspects play a role in its understanding. In this context, public authority risk communication should take into account the differences in the stakeholder perspectives and their respective position in the communication process as the structural elements of a social assessment and decision-making process about risks.

One key goal for improving public authority risk communication is, therefore, acceptance and consideration of different risk concepts when handling risks. This leads to the need to integrate consideration of different risk concepts into the operative working situations of risk assessment, management and communication. In order to achieve this goal, the following three measures are recommended. Whereas the first proposal is based on the current practice of risk communication, the two other proposals go beyond that.

(1) "Risk assessment and stakeholder" integration into BfR risk assessment
The task of BfR is to explore and assess the risks of substances, products and methods for the health of humans and animals and, where appropriate, to recommend measures and identify action areas. BfR carries out this task by publishing opinions on individual risk cases on its website. The structure, content and format of a BfR risk assessment is laid down in the "Guidelines for Health Assessments" (BfR 2005). According to them, a BfR risk assessment should comment on the subject matter of the assessment, present the results of the assessment and explain the various aspects of this assessment (e.g. reference to agent, hazard, exposure, risk characterisation).

The proposal is to integrate a chapter on "**Risk assessment and stakeholders**" into the BfR risk assessment. In that chapter the importance of concrete risk assessment for socially relevant groups should be discussed by BfR risk assessors. The goal is to highlight the acceptance of and different positions of stakeholders on this risk assessment in order to estimate their implications for the ensuing risk management measures. In this context it should be explained very clearly whether these are the estimations of the stakeholders themselves,

which must then be evidenced (self-assessments) or whether this is an interpretation of the stakeholder position (external assessment). Examples of questions, which could be handled in this section, are:

- Were stakeholders involved in the elaboration phase of the risk assessment? If so, how, who and what was the result?
- What positions do the stakeholders adopt on the individual aspects of the risk assessment (agent, hazard, exposure)?
- Is there stakeholder consensus/dissent about protection goals and protection levels or about the methodological approach (for instance toxicological parameters, relevant limit doses)?
- What recommendations and risk management measures are favoured by the stakeholders when it comes to dealing with the risk or hazard?

(2) Setting up of a body "Social handling of risks
The study has shown that there is a considerable "instrumentalisation mistrust" between the stakeholders involved in risk communication in Germany. The experts gave very concrete examples to underline this. The (long-term) building of trust and acceptance for different risk assessments between the stakeholders must be seen as a central challenge for future efficient and effective risk communication.

The proposal is to set up a **body "Social handling of risks".** In this viable expert circle (approx. 10-15 people) all relevant social groups should be represented. The "Jury Umweltzeichen" of the German environmental label "Blauer Engel" could serve as the model for the setting up of a body of this kind. It currently consists of 13 members who are representatives of environmental and consumer associations, trade unions, industry, commerce, trade crafts, municipalities, science, media, churches and the federal *Länder*. This proposal is, in principle, already contained in the demand for an ad hoc committee "Harmonisation of risk standards".

In the body proposed here the chair would be assumed by an independent person who is accepted by all sides. The body should meet two to three times a year. Its work orientation should be fundamental and strategic questions related to the handling of risks. Possible topics are:

- Commonalities and fundamental conceptual differences in the handling of risks by the stakeholders
- Development of proposed methods on how normative differences regarding the accepted/unaccepted risk level can be integrated into risk assessment and risk management methods
- Understanding about how to deal with different strategic positions of and conflict situations between stakeholders
- Identification and handling of "key risk areas" which will be of major social relevance in the future (for instance future technologies)

The work of the body should be drawn together – in a manner that is also visible to the outside – and supported by all its members. What is conceivable is, for instance, the elaboration of a guide "Social handling of risk".

(3) Pilot projects “Stakeholder participation”
Differences of opinion and other differences between the stakeholders in risk communication can be illustrated using a concrete case of risk. This has been shown by the extensive debate about nuclear power or genetically modified food. Furthermore, it must be borne in mind that because of accelerated technological and social developments and the related globalisation trends, there is a special and temporal blurring of risks. This new type of risk (systemic risk) has an extremely high damage potential. The social handling of “systemic” risks must, therefore, hold up in practice.

Against this backdrop the suggestion is to conduct[13] **innovative pilot projects in concrete risk areas** with the focus on stakeholder participation and the involvement of the people (potentially) affected. The goal of these pilot projects should be to develop methods that

- focus on the social handling of non-knowledge about specific risk sources;
- integrate different risk concepts (or benefit considerations, precautionary principles) of stakeholders into risk assessment methods, too;
- elaborate action options for risk management that reflect the complexity of systemic risks (keyword: unintended side effects) and secondly consider implementation barriers of an institutional, economic or legal nature.

5.3 Excursus: Participation methods in risk assessment

Participation methods in risk assessment offer several opportunities to involve interest groups, experts, politicians or the public at large. The **individual and collective perception, the normative judgement** of the acceptability of a given risk and the **context and accompanying circumstances of the risk situation** should be determined in the risk assessment in addition to the purely natural scientific-technical evaluation. It is, for instance, important for most people whether a risk is self-induced or they have been exposed to it without being asked (Renn *et al*. 2007: 92 ff.).

Individuals and groups, who take part in a risk assessment process, can help to classify a **risk** from normative points of view as **acceptable** or **unacceptable**. This assessment of acceptability is an explicit step in **integrative risk assessment** as envisaged by the IRGC risk concept (IRGC 2005, 36 ff.). The question of the tolerability or acceptability of a risk is placed at the interface between risk assessment and risk management and, depending on the type of risk and desired risk control process, may be attached to risk assessment or risk management.

Selection of the participants
In order to select a suitable participation process for risk assessment, a decision should be taken about the type of **inclusion**, i.e. the involvement of the persons and groups concerned. In principle it can be said that all the people who are directly or indirectly affected by the consequences of the respective decision, i.e. whose interests or values are positively or negatively influenced, should be included in the participatory process (Renn *et al*. 2007: 114).

[13] In the next Chapter (5.3) various forms of participation in risk assessment are explained in more detail.

In order to address the aspects of inclusion, the following questions must be answered:

- Who should be involved or "excluded"?
- What is the objective of the method (for instance opinion shaping, preferences, finding out about options, describing scenarios or making recommendations etc)?
- What level of vertical (federal level, Land level etc) or horizontal (regional, local etc) control or both is to be integrated into the procedure?
- How widespread is the procedure to be, i.e. where is it to take place and how long should it last (time details)?

Rules and voting procedure

Furthermore, the **closure** of the procedure must be stipulated in advance. It lays down the type of decision-making or the formulation of recommendations. How are the factual claims examined? What statutory or moral rules are used in order to assess acceptability? How is a vote taken in the end if there is no consensus? Closure describes how a procedure with the persons involved can be conducted to ensure that the target can be reached. To this end, the following must be clarified:

- Rules of evidence/line of argument
- Conviction: when does an argument convince the group?
- Voting procedure: how is a decision reached? Is a consensus necessary? Is one voting procedure sufficient?

Participation approaches

Besides these two basic methodological questions it is important to lay down the theoretical starting point for a participation process: Why should this procedure be staged at all, what is the purpose? Is there a wish for a functionalistic or neoliberal approach? Or are deliberative, post-modern or anthropological concepts what are wanted?

Table 20: Participation approaches and their goals

Participation approach	Goal	Characteristics	Examples
• Functionalistic	• Improvement in decisions by involving all knowledge bearers	• Plurality and openness, considerable inclusion, higher effectiveness, low efficiency	• Delphi, round table, hearing, citizen committees
• Neoliberal	• Representativeness of collective preferences	• Input of preferences of individuals, decisions should reflect the preferences	• Referendum, focus groups, • e-participation, mediation
• Post-modern	• Breakdown of standpoints into their plurality	• Recognition of pluralistic opinions and rationalities, search for solutions, no arrangements	• Fora, panel discussions, open space
• Deliberative	• Competing arguments, orientation towards the common good, not representative	• All arguments should be representative, consensus-oriented from the inner conviction of people in the exchange of arguments	• Rational discourse, citizen fora (planning cell), round tables
• Anthropological	• Input of "healthy human understanding" into a pragmatic if possible unanimous solution	• Involvement of laypersons, normal citizens, common sense	• Consensus conferences, citizen juries

Selected methods and their suitability for risk assessment

Methods for the participation of various target groups can be used in all phases of dealing with the risk, also in the assessment phase - the main task of BfR. Based on the target group five types of participation can be identified (according to Renn *et al*. 2007: 112):

Type 1: Coordination methods within institutions
Type 2: Expert comments between various institutions
Type 3: Discourse with external experts (scientific discussion)
Type 4: Involvements of representatives of social groups
Type 5: Involvement of the public at large

Tables 21–25 (partially adapted to Beckmann and Keck 1999, Ley and Weitz 2003) describe these five types of participation and also list selected methods, their characteristics and suitability for risk assessment (based on Renn *et al*. 2005).

Table 21: Type 1 – Coordination methods within institutions

Examples of participation methods	Goals	Target groups	Characteristics of the methods	Advantages and disadvantages
• Internal meetings, closed working groups, workshops	• Involvement of experts from different disciplines in the procedure • Mutual understanding, intelligible depiction of information contents, transparent processing of arguments and conclusions, establishment of a uniform level of knowledge	• Experts from an institution, e.g. risk assessors and risk managers	• Steered discussions, listing and visualisation of arguments, moderation methods	• Early involvement of stakeholders, recording of arguments, greater need for coordination

Table 22: Type 2 – Expert comments between various institutions

Examples of participation methods	Goals	Target groups	Characteristics of the methods	Advantages and disadvantages
• Working groups	• Comparison, regulation of a risk, similar to type 1: mutual understanding, clear depiction of information contents, transparent development of arguments and conclusions, establishment of a uniform level of knowledge	• Experts from several institutions	• Characteristics of the method: specify the type and nature of mutual information and responsibility for communication	• Avoidance of responsibilities, redundancies, usually unable to take decisions
• Round tables	• Clarification of assessment questions, concrete cases but also long-term planning , otherwise the same as for the point "working groups"	• Heterogeneous but fixed composition of participants	• Systematically structured process, moderator, process rules, principle of equal representation of participants, process able to deal with latent conflicts	• Neutral moderator, regular meetings, no change in participants, systematically structured, time-consuming
• Committees	• Evaluation, classification of assessment questions, decisions, otherwise as for point working groups	• Fixed composition of participants, experts	• Elaboration of recommendations, decisions	• Able to take decisions, scarcely no moderation or method rules, latent conflicts

Table 23: Type 3 – Discourse with external experts

Examples of participation methods	Goals	Target groups	Characteristics of the methods	Advantages and disadvantages
• Expert panels	• Mutual exchange, extend knowledge basis to clarify complex starting situation, highlight unclear data situation in data risk assessment	• Risk assessors and external scientists from different disciplines and opinions	• Coverage of the full spectrum of scientific opinions, consideration of minority votes, balanced assessment of risks	• Indication of minority votes, plurality of opinions
• Delphi rounds	• Creation of clarity (evidence) on a question	• Group of experts	• Written opinion by experts, after compilation of opinions, renewed assessment by experts, instruction: inclusion of all the results of the first survey round as a corrective of own judgement	• Knowledge generation, breaking down of conflict forms, information input for further processes, low effort involved
• Open space	• Selection of sub-topics, elaboration of questions, discussion of topics, compilation of measures	• 10 up to 100 participants, experts but also interested citizens, interest groups	• Open collection technique with no programme structure, topic proposals at the beginning of the conference, formation of interest-based small groups, minutes, final round	• Simple, rapid process, no stipulation of sub-topics

Table 24: Type 4 – Participation of representatives of social groups

This also encompasses the inclusion of the people who caused the risks and the social groups affected by the risks to the extent that their expert knowledge or their experience are of importance for risk assessment. In the case of controversial risks the criteria used in the weighing up process, should be discussed with the groups involved (Renn *et al*. 2007: 112 ff.)

Examples of participation methods	Goals	Target group	Characteristics of the methods	Advantages and disadvantages
• Stakeholder workshop	• Input of expert knowledge and experience, strengthening of trust-based relationship, highlighting of potential conflicting goals	• Maximum 30 participants, people who caused the risk, interest groups	• Processing of targeted questions • Moderation	• Simple, rapid method, usually only an exchange, discussion of a topic
• Scenario workshop	• Promotion of dialogue and joint planning by participants	• Experts	• Elaboration of scenarios by experts, presentation of scenarios, drawing up of action plans, procedural rules, moderation	• Comprehensive drawing up of the scenarios, time-consuming process
• Focus groups	• Recording of the mood of the participants, elaboration of a recommendation catalogue, recommendation character, recording of values and interests in the risk process	• Experts, people affected, representatives of interests	• Groups of 4-12 participants, moderated group interview lasting 2.5 hours, central question catalogue	• Mutual influencing during group discussion, generation of new ideas, lengthy acquisition process of participants, qualitative evaluation

“Risk assessments often come up against scepticism or distrust in a society with pluralistic values and political actions are constantly under pressure to offer justification. More than any other statements, risk statements are dependent on plausibility (i.e. intuitively mediated plausibility of the thought processes) and trust in the regulatory bodies. Risk regulation can, therefore, only succeed within an extensive, comprehension-oriented exchange with the interested public at large (Renn *et al*. 2007: 112 ff.).

Table 25: Type 5 – Participation of the public at large

Examples of participation methods	Goals	Target groups	Characteristics of the methods	Advantages and disadvantages
• Public interpretation	• Break down scepticism and mistrust, build up trust in regulatory bodies, gain insight into possible conflicting goals in the population	• Public at large	• With political and social pressure, with major intervention in basic rights	• In the case of controversial questions, only limited two-way communication
• Consensus conferences	• Involvement of everyday knowledge, supplemented by expert knowledge	• Citizen panel, if possible evenly spread across the entire population	• Establishment of expertise at two preparatory weekends, listing of key questions, public event with questions to expert panel by citizen panel, final report	• Citizens become experts, steering of the event by citizen panel
• Future workshops	• Draw up desirable, possible or even impossible future scenarios, examine for viability	• Maximum number of persons affected 15	• 3 phase: criticism phase, ideas/imagination phase, implementation/execution phase, moderator, 1-3 days	• Turn those affected into participants, creative atmosphere
• Future conference/search conference	• Development of ideal future scenarios, measures and action plans	• 60–70 participants, mixed circle of participants, people affected	• Development-oriented workshop, fixed structure, two moderators, two plenary sessions with self-organised small group work, duration 3 days	• Not suitable for concrete, conflict-ridden decisions
• Planning cell, citizen forum	• Elaboration of recommendations by informed experts	• Around 25 randomly selected citizens	• Citizen reports on a previously selected problem, information through presentations or questions to experts and representatives of interests	• High effort required, informed citizens
• Citizen summit	• Processing of questions down to catalogue of measures	• Several hundred participants	• Intensive discussion at round tables with maximum 10 participants and an exchange in a large plenary session	• Concrete results in one day, facilitate opinion diversity
• e-democracy, online method	• Exchange on the topic	• Citizens	• Open process, structured like a conference, but exchange via Internet fora, impartial moderation, stipulated lead questions, lasting several weeks	• Large circle of participants, low effort required, only people with an Internet connection, interest in the topic is decisive for participation

Continuation table 25: type 5 – Participation of the public at large

Examples of participation methods	Goals	Target groups	Characteristics of the methods	Advantages and disadvantages
• Citizen jury	• Debates about values, less suitable for identifying solutions	• Randomly selected citizens (jury members), based on characteristics of the population	• "Court with a magistrate", issuing of a recommendation after hearing all the arguments, questions put to jury members at the end of the process, similar to a planning cell	• Very long process (5-10 days), costly
• Cooperative discourse	• Complex decision-making processes, establishing criteria (value tree), clarification of effects, weighing up of action recommendations	• Interest groups, citizens	• 3-stage combined mediation method (establishing criteria), Delphi groups (weighing up), citizen forum (action recommendations)	• Very cost and time intensive, suitable for complex questions with a high conflict potential

6 Conclusions

Brief outline of the project
Risk communication is oriented towards the interactive exchange of information (estimations, assessments, opinions) on hazards and risks between various stakeholders involved in the communication process. The challenges facing risk communication can be broken down into structural challenges of the political-administrative system and challenges concerning the communication process itself. The assumption is that the latter are more open to concrete solution strategies than the structural challenge dimension. A fundamental problem of understanding - that is the hypothesis of this study - stems from the unclear understanding and different usage of the terms “risk” and “hazard”. The causes for the communication problems could be: different statutory provisions, competition between the stakeholders, instrumentalisation of the communication process, media exaggeration, various emotional and cognitive processing styles, different social roles (expert/layperson), knowledge deficits, differing attitudes towards damage, credibility and coordination shortcomings.

The Federal Institute for Risk Assessment commissioned the Institut für ökologische Wirtschaftsforschung (IÖW) gGmbH and Dialogik gGmbH

- to examine the understanding and usage of the terms “risk” and “hazard potential” in risk communication with the involvement of the stakeholders from the public authorities, NGOs, industry and associations;
- to develop action recommendations and options for possible organisational measures for federal institutions.

Project design
The focus of the project was on a literature analysis and a survey of a total of 53 experts from industry, environmental and consumer associations, and public authorities. Within the framework of the literature search approximately 400 literature sources were examined and out of them approximately 100 were evaluated in more detail as they were deemed to be particularly relevant sources for these specific questions addressed in this project. For the empirical data collection two different methods were selected: expert interviews and focus groups. The purpose of this methodological triangulation is to ensure a high level of validity for the results generated.

For the interviews experts were initially selected using the following main criteria: “relevance and importance” of the institutions represented by the experts or organisation in the “concert of interest groups” and “close proximity to the theme or discipline” of both the institutions and their representatives for the topics handled within the Federal Institute for Risk Assessment (BfR). The project team conducted telephone and personal interviews using a partially standardised and target group-specific questionnaire. It contained open and closed questions. The interviews were documented and evaluated in terms of quality and quantity.

In parallel the homogeneous focus groups with representatives of public authorities, industry and environmental and consumer associations were conducted, documented and evaluated qualitatively. The selection of participants was also undertaken on the basis of the above criteria. A combination of “Questioning Guide” and “Topic Guide Technique” was used for the moderation of the focus groups.

Project results

Despite the relatively "young" subject of research, research on risk communication is extremely diverse and differentiated. Even if the roots of risk communication research are to be found above all in North America, a research landscape on risk communication has become firmly established in Europe – not least in Germany

Nevertheless, the literature analysis reveals that the main question in this study, the question about different attitudes amongst stakeholders towards understanding and using the terms "risk" and "hazard" has scarcely been examined at all up to now. There is almost no explicit research on this question in the German-speaking and international research landscapes.

Some selected results from the literature analysis are presented theme-wise below:

- Understanding of the terms by discipline: in the usage by institutions, associations, public authorities and the public at large, the terms "risk", "hazard" and "danger" are frequently used to mean the same thing and there is no clear separation of the terms. Even the various scientific disciplines do not use these terms in a uniform manner. It is, therefore, understandable that semantic uncertainties can be multiplied during the transition from scientific circles to other expert circles (stakeholders from politics, industry and civil society) or beyond that to laypersons.
- Understanding of the terms by stakeholders: in the literature a distinction is made between six types of stakeholders on the analytical level: media, public at large, regulatory bodies/public authorities, associations/non-governmental institutions, industry and science. The positioning of the individual types of stakeholders in the communication process shows that there are stakeholder-specific communication needs and demands depending on where they are located in the area between risk causes, avoidance and concernedness. Communication about risk always encompasses discussions about responsibilities for the causing of risks, the need to avoid risks, information obligations and scale of concernedness.
- World views and risk concept: risks and hazards are perceived very differently by the various stakeholders. Their own world views are decisive contributory factors to the specific perception of risks. Depending on the stakeholder role various factors may be dominant for instance economic interests, responsibility for risk avoidance and precautionary measures or "watchdog or spokesman functions". Depending on the stakeholder perspective, a risk is interpreted very differently and communicated correspondingly. Different risk concepts merge into different communication contents and forms.
- Sound knowledge as a bridge: the more knowledge gaps there are about a specific risk or hazard case, the greater the likelihood of fundamental understanding and communication problems. The risk communication of concrete hazards is generally speaking less susceptible to comprehension problems between the stakeholders involved than the communication of concrete risks as in their case per definitionem a higher level of knowledge must be available.
- Differing protection goals: in risk assessment and risk management strategies are developed which, depending on the type of risk and situation, are oriented more towards the hazard or the risk. In the case of food and drinking water attention focuses mainly on the hazard aspect whereas in the case of chemicals and consumer goods the level of exposure is taken into account.

The results of the empirical evaluation show that there is no uniform understanding or uniform use of the terms risk and hazard by the various stakeholders. Some selected results of the expert interviews and focus groups discussions are outlined below:

- Understanding of risk communication: public authorities see risk communication as an ongoing reciprocal process of the exchange of information in particular amongst public authorities, NGOs and industry. NGOs and industry assign public authorities comprehensive responsibility for communication. The NGOs (but also industry) see themselves partly as spokespersons who provide the public at large with information from the public authorities and industries in a clear and "target group-specific" manner.
- The key tasks of risk communication: public authorities are attributed a comprehensive task profile involving the identification, estimation, assessment, management and communication of risks. The communication of risks should be comprehensive and target group-oriented. The target groups of public authority risk communication are the public at large, media, industry, civil society stakeholders, the sciences and downstream public authorities. NGOs, in contrast, mainly have a communication and control function (e.g. spokespersons for the public at large, representation of civil society interests) whereas industry is seen as being responsible for its "own" risks. It should also share its expert knowledge with public authorities, NGOs and the public at large.
- Understanding of the terms "risk"/"hazard": in public authorities a very coherent, as a rule toxicological understanding of the terms has emerged overall based on EU Regulation 178/2002[14]. Many public authority representatives believe that a hazard can be estimated very well whereas it is very difficult to calculate a risk. In the case of NGOs and industry the understanding is far more heterogeneous: differentiation dimensions are, for instance, concrete vs. abstract, actual vs. theoretical. It becomes clear that both terms are linked to and interpreted by various scientific disciplines. The term pair concrete vs. abstract for instance is based on a legal understanding. In some cases no differentiation between the terms is made or the terms are deemed to be unimportant for practice.
- Use of the terms: the term "hazard" is scarcely used; by contrast the term "risk" is used far more frequently. Public authorities frequently use the substitute "danger" or "damage" in their internal and external communications. In the case of NGOs and industry representatives, too, the terms are vague and unclear. However, on the expert level of risk assessment the situation is different. Here, the emphasis is on a precise definition.
- Stakeholder-specific risk concepts; in their own risk assessment public authorities take into account in particular criteria like length of exposure, spread of danger and probability of damage. The most important assessment criteria of NGOs are regulation of the risk and perception by the people affected. Industry, by contrast, stresses the probability of a benefit or damage.
- Influence of stakeholders in risk communication: NGOs and, more particularly, the media are said to have the greatest influence in risk communication. This shows that risk communication is understood as communication that deals above all with publicly perceived and high impact media risk topics.
- Risk communication practice: there are a number of practical examples of successful risk communication. One criterion for success is the detailed critical examination with the target group. Great imagination, creativity and diverse methods are important here. The goal is frequently to establish two-way communication with open and transparent flows of information.
- Special challenges in risk communication: divergent goals and motivation of the different stakeholders and mutual presumptions regarding the instrumentalisation of the risk topic are the main problems in risk communication. Other aspects that have been identified as problematic especially for public authorities and NGOs are late, incomplete information, a lack of transparency, overestimation and underestimation caused by distorted risk percep-

[14] Regulation (EC) No 178/2002 of the European Parliament and the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

tion and poor communication skills. This deficit analysis is attributed to all the stakeholders involved in risk communication.

Problem dimensions in the use of the terms "risk" and "hazard": semantics, concept, strategy, control

- Comprehension difficulties in the use of the terms "risk" and "hazard" are not restricted to the semantic linguistic level. It is far more the case that they also encompass conceptual, strategic and control-specific problems.
- Semantic problem level: different groups attribute different content to the terms of risk communication. The stakeholders, for example, use the terms hazard, hazard potential (in German), risk, damage, damage potential, disasters. They basically mean the same thing but use different terms to say it. This leads to the presumption that there is initially a problem of understanding between the stakeholders involved in the communication process because of partly different semantic interpretations and discipline-driven socialisation (for instance toxicology, food chemistry or epidemiology).
- Conceptual problem level: the stakeholders have different ideas about risk/hazard, i.e. different risk concepts. Behind these two terms hazard and risk there is a highly specific risk concept which stipulates that the hazard must be weighted by exposure. This means the hazard is qualified. Only when the hazard actually occurs (i.e. exposure is empirically provable), is it significant for us as a risk. If stakeholders orient their actions more towards a precautionary principle, then this concept is rejected as the guiding principle for their actions. Then it is not a comprehension problem but a problem of fundamentally different or competing risk concepts in social groups (problem of understanding).
- Strategic problem level: in the political opinion-shaping process, the stakeholders pursue different goals and strategies for communicating risks/hazards. Here, a distinction can be made between various strategies aiming to change attitudes, solve conflicts or influence decisions. Both terms are then instrumentalised on behalf of (individual) interests. What lies behind this is the problem of conflicting interests. This strategic problem raises the question about how to deal with these different strategies.
- Control-specific problem level: as the use of the terms risk/hazard has very specific implications for risk management, a control problem can also be identified in this context. The decisive – highly political - question is where risk regulation begins. When it is oriented towards the hazard aspect, the proposed measures mainly start with the risk agent or trigger. If there is an orientation towards probable occurrence and level of damage, then management measures will tend to start with the exposure side. All the same, the determination of a hazard and of a risk is not always clear when it comes to choosing a control approach. In the case of a concrete risk or hazard, conceptual and strategic differences may grow when handling the risks turns into a control problem.

Action recommendations

The action recommendations were developed using four particularly relevant theme areas derived from the empirical results:

- "Take into account the different risk concepts": a large number of stakeholders are directly or indirectly involved in the concrete handling of risks. If one accepts these diverse stakeholders, then the following observation should be made: the various stakeholders differ considerably in whether they classify something as a risk or a hazard. A risk or a hazard is also a social construct for this understanding of which social, cultural, political economic and other aspects play a role. In this context, the risk communication by public authorities should take note of the difference in the stakeholders' perspective and their respective location in the communication process as a structural characteristic of the social examination of a decision-making process about risks. For risk assessment and management this throws up the challenge of rendering transparent the respective conceptual backgrounds

of the argumentations of the various groups of stakeholders by drawing on concrete examples. Public authorities should, therefore, reveal their own definitions of the terms shaped by their own discipline backgrounds and ensure that these terms are understood in a similar manner by other disciplines. The proposed measures are: “risk assessment and stakeholder” integration into the BfR risk assessment, setting up of a body “social handling of risk” and pilot projects “stakeholder participation”.

- “Building skills”: the results of this study have shown that a lack of communication skills and expertise in dealing with risks and knowledge about risks can lead to or amplify risk communication problems. The main area of action is the building of communication skills in the stakeholders involved in risk communication. Measures in the field of “skill building” must aim to lastingly increase the communication skills of the stakeholders responsible for risk communication, particularly those of public authorities. Improving the expertise in the respective risk areas of all stakeholders involved in the communication process will enable them to take an active part in the risk assessment process. The measures are communication-training courses, mutual coaching by public authorities and stakeholders, and the setting up of a “risk and hazard” competence network.
- “Orient risk communication towards target groups”: the results of the literature and empirical evaluation of this study demonstrate that the stakeholders’ world views make a major contribution to the specific perception of risks and hazards. Differing roles – like profit-driven businessmen, risk avoidance managers, controllers and spokespersons – lead to different interpretations of the same risk situation. From the multi-causal (stakeholder role, cognitive processing, discipline ivory tower etc.) differences identified in the perception and interpretation of risks and hazards, a general demand can be derived that successful risk communication must be oriented in terms of content and form towards the respective target group. To this end, the measures “explanations of the BfR working definitions” of risk and hazard, the establishment of target group specific two-way communication and “new paths for communication with the public at large” are proposed.
- “Transparency and coordination”: late or inconsistent information triggers distrust of communicators, in the case of public authority risk communication distrust of public authority institutions. Against this backdrop transparent, coordinated and target group-oriented communication by public authorities is important. The proposed measures include first of all “speaking with one voice”. This encompasses individual measures like the setting up of a crisis troubleshooting team within public authorities, thinking in one language and the call for guidelines. Secondly, the setting up of two-way communication with feedback through measures like the creation of a “public authority-stakeholder-expert forum. A third action recommendation focuses on active communication behaviour vis a vis the public at large through, for instance, participation processes in risk assessment.

Different risk concepts amongst risk communication stakeholders

The starting point for this research project was examination of the understanding and use of the terms “risk” and “hazard” which are central to the political and social handling of risks by experts from public authorities and interest groups. It was shown that there are major differences in the understanding and use of these terms. They can be attributed firstly to semantic, more particularly multi-disciplinary, differences in interpretation. Secondly, they reflect the interest-driven strategic positions of stakeholders in the communication and decision-making process as well as fundamental, normative conceptual differences amongst the stakeholders when it comes to whether they classify something as a risk or hazard (risk assessment) and how they deal with these risks (risk management). Strategic and conceptual positions are not explicitly adopted by the stakeholders as a rule. However, they do become indirectly visible above all in negotiating processes about risk management options and their instrumental form – this is our interpretation. This leads to the following central action areas

- consideration of different risk concepts when dealing concretely with risks
- building up skills on risk and hazard amongst the stakeholders involved in assessment and management.

Risk and hazard: semantic uncertainties and target group orientation
The project findings indicate that there is no uniform semantic understanding of the terms risk and hazard amongst the different stakeholders. In particular the term hazard potential (in German) was interpreted in a highly heterogeneous manner on the content level. This term is scarcely used in communications as it is a "German word construct" and is seen as a pleonasm which is not represented semantically in everyday understanding either. If a scientific situation is explained, the tendency is more to talk about a risk. When the communication is with the public at large, then the term danger tends to be used. This shows that the requirements in the field of scientific assessment and estimation differ vis a vis the risk communication area. Whereas in risk assessment a distinction between risk and hazard is very helpful, the two terms do not seem to be particularly helpful for risk communication with public authorities. Communication strategies, processes and contents must be developed which convey this situation but can still be conveyed in the language of the target group or receivers. The translation of risk messages into different "stakeholder languages" is a central challenge in the following areas of action:

- "Orient risk communication towards target groups": to this end the measures "illustration of the BfR working definitions of risk and hazard" were suggested using concrete examples like the establishment of target group-specific, two-way communication and "new paths for communication with the population at large".
- "Transparency and coordination" with the establishment of proactive public authority communication behaviour vis a vis stakeholders and harmonisation of and transparent access to databases for interested stakeholders.

The proposed measures in the four action areas encompass procedural and institutional challenges when it comes to their implementation. If communication training is for instance envisaged, then the emphasis must be on the content profile and implementation process whereas institutional innovations are less relevant for concrete implementation. If one considers new communication pathways with the population at large or the setting up of bodies or working groups, then this throws up major challenges in respect of institutional innovations. For each envisaged measure the initiators should, therefore, initially sound out the procedural and institutional scope. Table 26 gives a qualitative assessment of the procedural and institutional requirements of the individual measures that can be seen as the first step towards implementation.

Table 26: Procedural/institutional requirements of the proposed measures

Measures	Procedural	Institutional
Action area 1: Build skills		
• Communication training	+	–
• Mutual coaching of public authorities and stakeholders	+	o
• Competence network "risk/hazard" with stakeholders and public authorities	o	o
Action area 2: Orient towards target group		
• Illustration of the BfR working definitions (risk-hazard)	+	–
• Establishment of target group-specific two-way communication	+	+
• New pathways for communicating with the population at large	o	+
Action area 3: Transparency and coordination		
• Speak with one voice	o	o
• Two-way communication with feedback	o	+
• Active communication with the public at large	+	o
Action area 4: Take concepts into account		
• Risk assessment and stakeholders: integration into BfR guides	+	–
• Set up body "Social handling of risks"	o	+
• Pilot projects stakeholder participation and participation of the people affected	+	o

+ = high o = average - = low

Source: own depiction

The next step is to publicise the results of this study amongst public authorities, coordinate individual measures in an internal public authority dialogue, and proceed to a selection for possible implementation. This process also involves testing the acceptance and feasibility of these measures amongst staff members, and sourcing further ideas for measures in the individual institutions.

7 References

Aijzen, I. (1991): The theory of planned behaviour. Organizational Behaviour and Human Decision Processes, 50, 179–211.

AS/NZS (1999) [Australia/New Zealand Risk Management Standard]: Risk Management. AS/NZS 4360:1999, Joint Australian and New Zealand Risk Management Standard.

Banse, G. (1996): Herkunft und Anspruch der Risikoforschung. In: Banse, G. (Ed.): Risikoforschung zwischen Disziplinarität und Interdisziplinarität. Berlin: 15–72.

Bechmann, G. 1990: Großtechnische Systeme, Risiko und gesellschaftliche Unsicherheit. In: Halfmann, J../Japp, K.P. (Eds.): Riskante Entscheidungen und Katastrophenpotentiale. Elemente einer soziologischen Risikoforschung. Opladen: Westdeutscher Verlag, 129–149.

Beckmann, J./Keck, G. (1999): Beteiligungsverfahren in Theorie und Anwendung: Akademie für Technikfolgenabschätzung in Baden-Württemberg, Stuttgart.

Benighaus, L./Gärtner, K./Utecht, A./Schöfer, M. (2006): Zeit für Ausbildung – Ausbildung in der Zeitarbeit. Ergebnisse zweier Fokusgruppen mit Experten, Arbeitsmarktakteuren und Unternehmern der Zeitarbeit. Unveröffentlichte Dokumentation. Heidelberg.

Bennett, P. (1990): Understanding Responses to Risk: Some Basic Findings. In: Benett, P. and Calman, K. (Eds.): Risk Communication of Public Health. Oxford: Oxford University Press, 1999.

BfR [Bundesinstitut für Risikobewertung] (2005): Leitfaden Format für gesundheitliche Bewertungen, Berlin, eigene Veröffentlichung.
http://www.bfr.bund.de/cm/221/bfr_leitfaden_format_fuer_gesundheitliche_bewertung.pdf, Access: 14.06.2007).

Bloor, M./Frankland, J./Thomas, M./Robson, K. (2001): Focus Groups in Social Research. London, Thousand Oaks: Sage Publications.

Bogner, A./Menz, W. (2002): Expertenwissen und Forschungspraxis: die modernisierungstheoretische und die methodische Debatte um die Experten. Zur Einführung in ein unübersichtliches Problemfeld. In: Bogner, A. *et al.* (Ed.): Das Experteninterview. Theorie, Methode, Anwendung. Opladen: 7–30.

CEFIC (2006) [European Chemical Industry Council]: Glossary, Available on: http://www.cefic.be, “terms” in Glossary, [Access: 10.11.2006].

Chaiken, S./Liberman, A.,/Eagly, A. (1989): Heuristic and systematic information processing within and beyond the persuasion context. In: Uleman, J./Bargh, J. (Eds.), Unintended thought. New York: Guilford Press, 212–252.

Clarke, L. (1988): Politics and Bias in Risk Assessment. In: The Social Science Journal, 25 (2), 155–165.

Covello, V./von Winterfeld, D./Slovic, P. (1986): Risk Communication: A Review of the Literature, Risk Abstracts, 3, 171–182.

Cox, P./Niewöhner, J./Pidgeion, N./Gerradd, S./Fischhoff, B./Riley, D. (2003): The Use of Mental Models in Chemical Risk Protection: Developing a Generic Workplace Methodology. In: Risk Analysis, 23 (2), 311–324.

Deeke, Axel (1995): Experteninterviews – ein methodisches und forschungspraktisches Problem. Einleitende Bemerkungen und Fragen zum Workshop. In: Brinkmann, C. *et al.* (Ed.): Experteninterviews in der Arbeitsmarktforschung. Diskussionsbeiträge zu methodischen Fragen und praktischen Erfahrungen, BeitrAB 191, Bayreuth, 7–22.

Dietz, T./Rycroft, R. (1987): The risk professionals, New York: Russell Sage.

Douglas, M. (1990): Risk as a Forensic Resource. Daedalus, 119(4), 1–16.

Dürrenberger, G./Behringer, J. (1999): Beteiligungsverfahren in Theorie und Praxis. Leitfaden der Akademie für Technikfolgenabschätzung in Baden-Württemberg. Stuttgart.

Dunwoody, S. (1992): The Media and Public Perception of Risk: How Journalists Frame Risk Stories. In: Bromley, D.W./Segerson, K. (Eds.): The Social Response to Environmental Risk, Boston.

Earle, T. C./Cvetkovich, G. T./Slovic, P. (1990). The effect of involvement, relevance and ability on risk communication effectiveness. In: Borcherding, K./Larichev, O. I./Messick, D. M. (Hrsg.): Contemporary issues in decision making. Amsterdam, 271–291.

Earle, T.C./Cvetkovich, G. 1995: Social Trust: Towards a Cosmopolitan Society. Westport, CT.

Englander, T./Farago, K./Slovic, P./Fischhoff, B. (1986): A comparative analysis of risk perception in Hungary and the United States. In: Journal of Social Behavior, 55–66.

EPA [U.S. Environmental Protection Agency] (2002): Risk Communication.

Erev, I./Cohen, B.L. (1990): Verbal versus numerical probabilities: Efficiency, biases, and the preference paradox. Organizational Behavior and Human Decision Processes, 45, 1–18.

EU [European Union] (1994): Commission Regulation (EC) No. 1488/94 of 28 June 1994 laying down the principles for the assessment of risks to man and the environment of existing substances in accordance with council Regulation (EEC) No. 793/93.

EU [European Union] (2002): Regulation (EC) No. 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

FAO (o.J.) [Food and Agriculture Organization]: Codex Alimentarius Commission – Procedural Manual – Twelfth Edition, Available on:
http://www.fao.org/docrep/005/y2200e/y2200e07.htm, [Access: 10.11.2006].

FAO [Food and Agriculture Organization] (Hrsg.) (2005): Risk Communication Manual. ASIA BIONET. “Capacity Building in Biosafety of GM crops in Asia”. Document No. 1.2005. Available on: asiabionet.org/documents/PublicParticipationandAwarenessTrainor's Manual1.pdf [Access: 09.11.2006].

Gläser, J./Laudel, G. (2004): Experteninterviews und qualitative Inhaltsanalyse, Wiesbaden.

Gormely, W. (1987): Professionalism Within Environmental Bureaucracies: The Policy Implications of Personnel Choices, Occasional Paper, Madison: Robert M. La Follette Institute.

Gray, P. C. R. (1996): Risk Indicators: Types, Criteria, Effects. A framework for analysing the use of indicators and comparisons in risk communication, 56, edited by AG. MUT, FZ Jülich.

Gutteling, J.M./Wiegmann, O. (1996): Exploring risk communication. Dordrecht: Kluwer.

Gyrd-Hansen D./Kristiansen I.S./Nexoe J./Nielsen J.B. (2003): How do individuals apply risk information when choosing amongt health care interventions? Risk Analysis 2003; 23, 697–704.

Halpern, D.F./Blackman, S./Salzman B. (1989): Using statistical risk information to assess oral contraceptive safety. App Cogn Psychol 3, 251–260.

Hauptmanns, U. 1997: Risk Assessment in the Federal Republic of Germany. Arbeitsbericht Nr. 94 der Akademie für Technikfolgenabschätzung. Stuttgart: Akademie für Technikfolgenabschätzung

Hauptmanns, U./Herttrich, M./Werner, W. 1987: Technische Risiken: Ermittlung und Beurteilung. Berlin

Hennen, L. (1990): Risiko-Kommunikation: Informations- und Kommunikationstechnologien. In: Jungermann/Rohrmann/Wiedemann (Ed.): Risiko-Konzepte, Risiko-Konflikte, Risiko-Kommunikation, Jülich, 209–258.

Henschler, D. (2006):Kommentierung des Fragebogens zum Projekt durch Prof. Dr. D. Henschler, emeritus, Universität Würzburg, (unpublished manuscript).

Henseling, Ch./Hahn, T./Nolting, K. (2006): Die Fokusgruppentechnik als Instrument in der Umwelt- und Nachhaltigkeitsforschung. IZT, Institut für Zukunftsstudien und Technologiebewertung. Berlin. Download: http://www.izt.de/publikationen/werkstattberichte/index.html (Access: 20.10.2006).

IRGC (2006) [International Risk Governance Council]: White Paper on Risk Governance: Towards an Integrative Framework. Geneva: International Risk Governance Council 2005, p. 19. Available on: http:/www.irgc.org/irgc/projects/risk_characterisation/_b/contentFiles/IRGC_WP_No_1_Risk_Governance_(reprinted_version).pdf, [Access: 10.11.2006].

Jaeger, C.C./ Renn, O./ Rosa, E.A./ Webler, Th. (2001): Risk, Uncertainty and Rational Action. London: Earthscan.

Japp, K. P. (1996): Soziologische Risikotheorie – Funktionale Differnzierung, Politisierung und Reflextion, Weinheim, München: Juventa.

Jasanoff, S. (1987): Risk Management and Political Culture. A Comparative Study of Science in the Policy Context, New York, Sage.

Jianguang, Z. (1994): Environmental hazards in the Chinese public's eyes. In: Risk Analysis, 14, pp. 163–169.

Jungermann, H./Schuetz, H./Thuering, M. (1988). Mental models in risk assessment: informing people about drugs. In: Risk Analysis, pp. 147–155.

Jungermann, H./Slovic, P. (1993): Die Psychologie der Kognition und Evaluation von Risiko, in: Bechmann, G. (Ed.). Risiko und Gesellschaft. Grundlagen und Ergebnisse interdisziplinärer Risikoforschung. Opladen: Westdeutscher Verlag. pp. 167–207.

Johnson, B./Slovic, P. (1995): Presenting uncertainty in health risk assessment: Initial studies of its effects on risk perception and trust. In: Risk Analysis 15/4 (1995), pp. 485–494.

Johnson, B.B./Slovic, P. (1998). Lay views on uncertainty in environmental health risk assessment. Journal of Risk Research 1 (4), pp. 261–279.

Kaplan, S./Garrik, J.B. 1993: Die quantitative Bestimmung von Risiko. In: Bechmann, G. (Ed.): Risiko und Gesellschaft. Grundlagen und Ergebnisse interdisziplinärer Risikoforschung. Opladen, 91–124

Karger, C.R. (1995): Naturschutz in der Kommunikationskrise?, Programmgruppe MUT – Arbeiten zur Risikokommunikation, 53

Karger, C.R./ Wiedemann, P.M (1995): Wahrnehmung von Umweltproblemen. In: Naturschutz und Landschaft, 69, 1: 3–8.

Kasperson, R. E. (1992): The Social Amplification of Risks: Progress in Developing an Integrative Framework. In: Krimsky, S. and Golding, S. (Eds.): Social Theories of Risk. Preager, Westport CT, pp. 153–178.

Kasperson, R.E./Kasperson, J.X. 1983: Determining the Acceptability of Risk: Ethical and Policy Issues, in: J.T. Rogers und Bates, D.V. (Ed.), Assessment and Perception of Risk to Human Health. Conference Proceedings, Royal Society of Canada. Ottawa: pp. 135–155.

Kasperson, R./Golding, D./Tuler, S. 1992: Social Distrust as Factor in Siting Hazardous Facilities and Communicating Risks. Journal of Social Sciences, 48: pp. 161–187.

Kepplinger, H.M. (1989): Künstliche Horizonte. Folgen, Darstellung und Akzeptanz von Technik in der Bundesrepublik, Frankfurt/Main.

Klinke; A. und Renn, O. 2002: A New Approach to Risk Evaluation and Management: Risk-Based, Precaution-Based and Discourse-Based Management. Risk Analysis, Vol. 22, No. 6, pp. 1071–1994

Kolluru R.V./Brooks, D.G. 1995: Integrated Risk Assessment and Strategic Management. In: Kolluru, R.V.; Bartell, S.; Pitblade, R.; und Stricoff, S. (Ed.): Risk Assessment and Management Handbook. For Environmental, Health, and Safety Professionals. New York, pp. 2.1–2.23.

Kranwischer, Detlef (o.J.): Experteninterviews - die Erhebung, Verwaltung und Dekonstruktion von Expertenwissen. Universität Jena, S. 91–112. Available on: http://www.uni-flensburg.de/geo/H_Seite_91–112_kanwischer.pdf [Access: 08.11.2006].

Kraus, N./Malmfors, T./Slovic, P. (1992): Intuitive Toxicology: Experts and Lay Judgments of Chemical Risks. In: Risk Analysis, Vol. 12, No. 2, pp. 215–232.

Krüger, Richard A. (1998): Analyzing and Reporting Focus Group Results (Focus Group Kit) (Taschenbuch). Sage Publications (January 1998).

Krüger, Richard A. (2000): Focus Groups. A Practical Guide for Applied Research. SAGE Publications Ltd; Edition: 3rd Spiral (31 July 2000).

Lamnek, S. (1995): Qualitative Sozialforschung Bd.1 und 2, 3.korrigierte Auflage, Psychologie Verlag Union München, Weinheim.

Lamnek, S. (1998): Gruppendiskussion. Theorie und Praxis. Weinheim: Psychologie Verlags Union.

Lasswell, H.D. (1948): The structure and function of commmunication in society, in: Bryson, L. (ed.): The communication of ideas. New York, pp. 37–52.

Ley, A./Weitz, L. (2003): Praxis Bürgerbeteiligung. Ein Methodenhandbuch. Arbeitshilfen für Selbsthilfe und Bürgerinitiativen Nr. 30, Verlag Stiftung Mitarbeit und Agenda Transfer, Bonn.

Luhmann, N. (1990): Risiko und Gefahr, in: ders.: Soziologische Aufklärung 5 - Konstruktivistische Perspektiven, Opladen, pp. 131–169.

Luhmann, Niklas (1991): Soziologie des Risikos, Berlin, New York

Lundgren, R. E. (1994): Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks. Battelle Press, Columbus, Ohio

Lynn, F. (1987): OSHA's Carcinogens Standard: Round One on Risk Assessment Models and Assumptions. In: Covello, V / Johnson, B (Eds.): The Social and Cultural Construction of Risk, Reidel Publishing, Holland, pp.345–358.

Magat, W./Viscusi, W./Huber, J. (1987): Risk-Dollar Tradeoffs, Risk Perceptions, and Consumer Behavior. In W. Viscusi & W. Magat (Eds.), Learning About Risk Cambridge, MA: Harvard University Press, pp. 83–97.

Mayring, P. (1990): Einführung in die qualitative Sozialforschung, München.

McGuire, W.J. (1985): Attidudes an attitude change, in: Lindzey, G./Aronson, E. (Eds.); Handbook of social psychology. Vol II. New York, pp. 233–346.

Medienkritik (1995): Mobilisierung statt Aufklärung. 31.07.1995.

Meggle, G. (1997): Theorien der Kommunikation. Eine Einführung, in: Lueken/ G.- L. (Ed.), Kommunikationstheorien – Theorien der Kommunikation. Leipzig, 1997, pp.14 – 40.

Meier, W.A. (1996): Risiko-Kommunikation und Katastrophen: Herausforderungen für Medien und Wirtschaftsunternehmen, in: Meier, W.A. und Schanne, M. (Hg.): Gesellschaftliche Risiken in den Medien: Zur Rolle des Journalismus bei der Wahrnehmung und Bewältigung gesellschaftlicher Risiken, Zürich, pp. 121–142.

Meuser, Michael; Nagel, Ulrike (1991): ExpertInneninterviews – vielfach erprobt, wenig bedacht. Ein Beitrag zur qualitativen Methodendiskussion, in: Garz, Detlef; Kraimer, Klaus [Eds.] (1991): Qualitativ-empirische Sozialforschung. Konzepte, Methoden, Analysen. Opladen, pp. 441–471.

Miles, F./Frewer, L. (2003): Public perception of scientific uncertainty in relation to food hazards. In: Journal of Risk Research, 6, 3, pp.267–283.

Mileti, Dennis/Nathe, Sarah/Gori, Paula/Greene, Marjorie/Lemersal, Elizabeth (2004): Public Hazards Communication and Education: The State of the Art, in: Informer (update of Issue 2, originally published in 1999), March 2004.

Mohr, Hans (1996): Das Expertendilemma. In: Nennen, Heinz-Ulrich / Garbe, Detlef (Eds.): Das Expertendilemma : Zur Rolle wissenschaftlicher Gutachter in der öffentlichen Meinungsbildung, Berlin, Springer, pp. 3–24.

Morgan, D. L. (1997): Focus Groups as Qualitative Research, in: Qualitative research Methods, Series No. 16, Thousand Oaks.

Morgan, K. (2005): Developments of a Preliminary Framework for Informing the Risk Analysis and Riskmanagement of Nanoparticles. In: Risk Analysis, 25(6), pp. 1621–1635.

NRC (1989) [National Research Council]: Improving Risk Communication. Washington: National Academy Press, 1989, pp.321.

OECD [Edit.] (2002): OECD Guidance Document on Risk Communication for Chemical Risk Management. OECD Environment, Health and Safety Publications. Series on Risk Management, No. 16.

Petty, R. E./Cacioppo, J. T. (1986): Communication and persuasion: Central and peripheral routes to attitude change, New York: Springer-Verlag.

Pfadenhauer, Michaela (2002): Auf gleicher Augenhöhe reden. Das Experteninterview – ein Gespräch zwischen Experte und Quasi-Experte. In: Bogner, Alexander et al. [Ed.] (2002): Das Experteninterview. Theorie, Methode, Anwendung. Opladen, pp. 113–130

Purchase, I./Slovic, P. (1999): Perspective: quantitative risk assessment breed fear, In. Human and Ecological Risk Assessment, 5, 3, pp-445–453.

Renn, O. (1992): Concepts of Risk: A classification, in: S. Krimsky & D. Golding (Eds.): Theories of Risk, Westport: Praeger, pp. 53–79.

Renn, O./Zwick M.M. (1997): Risiko- und Technikakzeptanz. In: Deutscher Bundestag, Enquete-Kommission „Schutz des Menschen und der Umwelt“ (Ed.): Konzept Nachhaltigkeit, Berlin, Springer

Renn, Ortwin/ Kastenholz, Hans (2000): Risk Communication for Chemical Risk Management, in: Bundesinstitut Für gesundheitlichen Verbraucherschutz und Veterinärmedizin (Ed.): An OECD Background Paper for the OECD-Workshop Berlin, September 2000.

Renn, Ortwin *et al.* (2005): ERiK – Entwicklung eines mehrstufigen Verfahrens der Risikokommunikation, (Eds.: Hertel, R.F. und G. Henseler. BfR. 02/2005, Berlin: BfR-Berlin-Dahlem.

Renn, Ortwin *et al.* (2007): Risiko aus sozialökologischer Perspektive. Eine interdisziplinäre und integrative Sichtweise des gesellschaftlichen Umgangs mit Unsicherheit. Oekom Verlag, München.

Risikokommission (2003): Ad hoc-Kommission »Neuordnung der Verfahren und Strukturen zur Risikobewertung und Standardsetzung im gesundheitlichen Umweltschutz der Bundesrepublik Deutschland.« Abschlussbericht der Risikokommission im Auftrag des Bundesministeriums für Gesundheit und Soziale Sicherung und des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit. Geschäftsstelle c/o Bundesamt für Strahlenschutz, Salzgitter

Rohrmann, B./Renn, O. (2000): Introduction, in; O. Renn/B. Rohrmann (Eds.): Cross-Cultural Risk Perception, Dordrecht, pp. 5–32.

Rosa, E. 1997: Metatheoretical Foundations for Post-Normal Risk. In: Journal of Risk Research. Year 1, 1:15–44.

Ruddat, Michael/Sautter, Alexander; *et al.* (2005): Abschlussbericht zum Forschungsprojekt „Untersuchung der Kenntnis und Wirkung von Informationsmaßnahmen im Bereich Mobilfunk und Ermittlung weiterer Ansatzpunkte zur Verbesserung der Information verschiedener Bevölkerungsgruppen“. Stuttgart.

Schramm, W. (1954): “How Communication Works,” in The Process and Effects of Communication, ed. Wilbur Schramm, Urbana: University of Illinois Press, pp. 3–26.

Schütz, H./Wiedemann, P.M./Gray, P.C.R. (2000): Risk Perception Beyond the Psychometric Paradigma. Arbeiten zur Risiko-Kommunikation, Heft 78, Jülich.

Schütz, H./Peters, H. P. (2002): Risiken aus der Perspektive von Wissenschaft, Medien und Öffentlichkeit. In: Aus Politik und Zeitgeschichte (APuZ). Beilage zur Wochenzeitung "Das Parlament", B 10–11/2002: 40–45.

Schütz, Holger/ Wiedemann, Peter M. /Hennings, W. /Mertens Johannes /Clauberg, M. (2003): Vergleichende Risikobewertung. Konzepte, Probleme und Anwendungsmöglichkeiten, Abschlussbericht BfS-Projekt.

Schulz von Thun, F. (1999): Miteinander reden. Störungen und Klärungen. Stile, Werte und Persönlichkeitsentwicklung. Hamburg.

Shannon, C. E./ Weaver, W. (1949): A Mathematical Model of Communication. Urbana, IL: University of Illinois Press.

Simon, H.A. (1957): Models of man. New York, NY: Wiley

Sjöberg, L./Moen, B.-E.; Rundmo, T. (2004): Explaining risk perception: An evaluation of the psychometric paradigm in risk perception research, Trondheim.

Slovic, P. (1987). Perception of risk. In: Science, 236, pp. 280–285.

Slovic, P. (1992). Perceptions of Risk: Reflections on the Psychometric Paradigm. In: Krimsky, S. and Golding, D. (Eds.): Social Theories of Risk, Praeger: Westport, CT, pp. 117–152.

Slovic, P./Fischhoff, B./Lichtenstein, S. (1980): Facts and fears – understanding risk. In R. C. Schwing & W. A. Albers (Eds.), Societal risk assessmen,t New York, Plenum, pp. 181–218.

Slovic, P./Fischhoff, B./Lichtenstein, S. (1985). Characterizing perceived risk. In R. W. Kates, C. Hohenemser, & J. X. Kasperson (Eds.), Perilous progress: managing the hazards of technology (pp. 91–125). Boulder: Westview.

Slovic, P./Malmfors, T./Krewski, D. *et al.* (1995): Intuitive Toxicology 2: Expert and Lay Judgements of Chemical Risks in Canada. In: Risk Analysis, Vol. 15, pp. 661–657.

SRU [Rat von Sachverständigen für Umweltfragen] (1999): Umwelt und Gesundheit. Risiken richtig einschätzen. Verlag Metzler-Poeschel, Stuttgart.

Steyaert, S./Lisoir, H./Nentwich, M. (Eds.), 2006: Fokusgruppen, Leitfaden partizipativer Verfahren. Ein Handbuch für die Praxis. Brussels/Vienna: Flemish Institute for Science and Technology Assessment, König-Baudouin-Stiftung, Institut für Technikfolgen-Abschätzung,

S. 127–136, Download http://epub.oeaw.ac.at/ita/ebooks/Leitfaden_pTA_DE_Feb06.pdf (Access 24.10.2006).

Stone E./Yates J.F./Parker A.M.(1994): Risk communication: absolute versus relative expressions of low-probability risks. Org Behav Hum Decis Process, 60: pp. 387–408.

Störfallkommission beim Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit [Hrsg.] (2005): Leitfaden Schnittstelle Notfallplanung. Erarbeitet durch den Arbeitskreis „Schnittstelle Notfallplanung". SFK-GS-45. Available on: http:// www.sfk-taa.de/berichte_reports/berichte_sfk/sfk_gs_45.pdf [Access: 09.11.2006].

Tittes, E. 1986: Zur Problematik der Wahrscheinlichkeitsrechnung bei seltenen Ereignissen. In: Compes, P.C. (Ed.): Technische Risiken in der Industriegesellschaft. Erfassung, Bewertung, Kontrolle. Wuppertal, 345–372

Tversky, A./Kahneman, D. (2005): Judgment under Uncertainty: Heuristics and Biases. In Bazerman, Max H (Ed), Negotiation, decision making and conflict management, Vols 1–3., pp. 251–258. Northampton, MA, US: Edward Elgar Publishing.

United Nations (2004): Living with Risk – A global review of disaster reduction initiatives (2 Volumes, Terminology). New York and Geneva: United Nations ISDR. Available on: http:// www.unisdr.org/eng/about_isdr/basic_docs/LwR2004/Annex%201%20Terminology. pdf, [Access: 10.11.2006].

U.S. Department of Health and Human Services [Ed.] (2002): Communicating in a Crisis: Risk Communication Guidelines for Public Officials. Available on http://www.riskcommunication.samhsa.gov/RiskComm.pdf [Access: 09.11.2006].

U.S. Public Health Service [Ed.] (1995): Risk Communication: Working With Individuals and Communities To Weigh the Odds. February/March 1995. Available on: http://odphp.osophs.dhhs.gov/pubs/prevrpt/Archives/95fm1.htm [Access: 09.11.2006].

Watzlawick, P. (2000): Menschliche Kommunikation. Formen, Störungen, Paradoxien. 10., unveränderte Auflage. Bern.

WBGU (1999) [Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen]: Welt im Wandel: Strategien zur Bewältigung globaler Umweltrisiken. Hauptgutachten 1998, Available on: http:// www.wbgu.de/wbgu_jg1998.pdf, [Access: 10.11.2006].

Weymann, A. K./Kelly, C. J. (1999): Risk Perception and Risk Communication: A Review of Literature, Sheffield.

Wiedemann, P.M. (1999): Risikokommunikation: Ansätze, Probleme und Verbesserungsmöglichkeiten. Arbeiten zur Risikokommunikation, Heft 70, edited by the AG. MUT, FZ Jülich.

Wiedemann, Peter M. [Ed.] (2000): Leitfaden Risikokommunikation für Unternehmen. Im Auftrag des Vereins Deutscher Ingenieure herausgegeben, Düsseldorf.

Wiedemann, P. M./Schütz, H. (2000): Developing Dialogue-Based Communication Programmes. Arbeiten zur Risiko-Kommunikation, Heft 79. Programmgruppe Mensch, Umwelt, Technik des Forschungszentrums Jülich, Jülich.

Wiedemann, P./Schütz, P. (2006): Risikokommunikation im Überblick. In: V. Linneweber / E.-D. Lantermann (Eds.): Enzyklopädie der Psychologie: Umweltpsychologie (Vol. 2), Göttingen, Hogrefe (about to be published).

Wilkinson, I. (2001): Social Theories of Risk Perception: At Once Indispensable and Insufficient, In: Current Sociology, 49(1), pp. 1–22.

WHO (2002) [World Health Organisation]: World Health Report. 'Defining and Assessing Risks to Health', What are risks to health?, Chapter 2, Available from: http:// www.who.int/whr/2002/chapter2/en/index1.html, [Access: 10.11.2006].

Witte, Erich H. (2002): Fokusgruppen. Techniken zur Leistungsverbesserung aufgabenorientierter Kleingruppen. Universität Hamburg. Seminarunterlagen. Download http://www.uni-hamburg.de/fachbereiche-einrichtungen/fb16/absozpsy/Projekt-02.pdf (Access 18.10.2006).

8 List of Figures

9 List of Tables

Publications that have already appeared in the BfR-Wissenschaft series

01/2004 Edited by L. Ellerbroek, H. Wichmann-Schauer, K. N. Mac
Methoden zur Identifizierung und Isolierung von Enterokokken und deren Resistenzbestimmung
€ 5

02/2004 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2002
€ 15

03/2004 Edited by A. Domke, R. Großklaus, B. Niemann, H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Verwendung von Vitaminen in Lebensmitteln – Toxikologische und ernährungsphysiologische Aspekte
€ 15

04/2004 Edited by A. Domke, R. Großklaus, B. Niemann, H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Verwendung von Mineralstoffen in Lebensmitteln – Toxikologische und ernährungsphysiologische Aspekte
€ 15

05/2004 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2003
€ 15

01/2005 Edited by A. Weißenborn, M. Burger, G.B.M. Mensink, C. Klemm, W. Sichert-Hellert, M. Kersting und H. Przyrembel
Folsäureversorgung der deutschen Bevölkerung – Abschlussbericht zum Forschungsvorhaben
€ 10

02/2005 Edited by R. F. Hertel, G. Henseler
ERiK – Entwicklung eines mehrstufigen Verfahrens der Risikokommunikation
€ 10

03/2005 Edited by P. Luber, E. Bartelt
Campylobacteriose durch Hähnchenfleisch
Eine quantitative Risikoabschätzung
€ 5

04/2005 Edited by A. Domke, R. Großklaus, B. Niemann. H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Use of Vitamins in Foods
Toxicological and nutritional-physiological aspects
€ 15

01/2006 Edited by A. Domke, R. Großklaus, B. Niemann, H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Use of Minerals in Foods
Toxicological and nutritional-physiological aspects
€ 15

02/2006 Edited by A. Schulte, U. Bernauer, S. Madle, H. Mielke, U. Herbst, H.-B. Richter-Reichhelm, K.-E. Appel, U. Gundert-Remy
Assessment of the Carcinogenicity of Formaldehyde
€ 10

03/2006 Edited by W. Lingk, H. Reifenstein, D. Westphal, E. Plattner
Humanexposition bei Holzschutzmitteln – Abschlussbericht zum Forschungsvorhaben
€ 5

04/2006 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2004
Übersicht über die Meldungen der Bundesländer
€ 15

05/2006 Edited by J. Zagon, G. Crnogorac, L. Kroh, M. Lahrssen-Wiederholt, H. Broll
Nachweis von gentechnisch veränderten Futtermitteln – Eine Studie zur Anwendbarkeit von Verfahren aus der Lebensmittelanalytik
€ 10

06/2006 Edited by A. Weißenborn, M. Burger, G.B.M. Mensink, C. Klemm, W. Sichert-Hellert, M. Kersting, H. Przyrembel
Folic acid intake of the German population – Final report on the research project
€ 10

01/2007 Edited by A. Epp, R. Hertel, G.-F. Böl
Acrylamid in Lebensmitteln – Ändert Risikokommunikation das Verbraucherverhalten?
€ 5

02/2007 Edited by B. Niemann, C. Sommerfeld, A. Hembeck, C. Bergmann
Lebensmittel mit Pflanzensterinzusatz in der Wahrnehmung der Verbraucher
Projektbericht über ein Gemeinschaftsprojekt der Verbraucherzentralen und des BfR
€ 5

03/2007 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2005
Übersicht über die Meldungen der Bundesländer
€ 15

04/2007 Edited by R. F. Hertel, G. Henseler
ERiK – Development of a multi-stage risk communication process
€ 10

05/2007 Edited by B. Niemann, C. Sommerfeld, A. Hembeck, C. Bergmann
Plant sterol enriched foods as perceived by consumers
Project report on a joint project of consumer advice centres and BfR
€ 5

01/2008 Edited by A. Epp, R. Hertel, G.-F. Böl
Formen und Folgen behördlicher Risikokommunikation
€ 5

02/2008 Edited by T. Höfer, U. Gundert-Remy, A. Epp, G.-F. Böl
REACH: Kommunikation zum gesundheitlichen Verbraucherschutz
€ 10

03/2008 Edited by R. Zimmer, R. Hertel, G.-F. Böl
BfR-Verbraucherkonferenz Nanotechnologie
Modellprojekt zur Erfassung der Risikowahrnehmung bei Verbrauchern
€ 5

04/2008 Edited by M. Hartung
Erreger von Zoonosen in Deutschland im Jahr 2006
Mitteilungen der Länder zu Lebensmitteln, Tieren, Futtermitteln und Umweltproben
€ 15

052008 Edited by R. Zimmer, R. Hertel, G.-F. Böl
Wahrnehmung der Nanotechnologie in der Bevölkerung
Repräsentativerhebung und morphologisch-psychologische Grundlagenstudie
€ 10

01/2009 Edited by R. Zimmer, R. Hertel, G.-F. Böl
Public Perceptions about Nanotechnoloogy
Representative survey and basic morphological-psychological study
€ 10

02/2009 Edited by E. Ulbig, R. F. Hertel, G.-F. Böl
Evaluierung der Kommunikation über die Unterschiede zwischen „risk“ und „hazard“ – Abschlussbericht
€ 5

03/2009 Edited by R. Zimmer, R. Hertel, G.-F. Böl
BfR Consumer Conference Nanotechnology
Pilot project to identify consumer risk perception
€ 5

04/2009 Edited by R. Zimmer, R. Hertel, G.-F. Böl
BfR-Delphi-Studie zur Nanotechnologie
Expertenbefragung zum Einsatz von Nanomaterialien in Lebensmitteln und Verbraucherprodukten
€ 10

05/2009 Edited by M. Hartung
Erreger von Zoonosen in Deutschland im Jahr 2007
Mitteilungen der Länder zu Lebensmitteln, Tieren, Futtermitteln und Umweltproben
€ 15

01/2010 Edited by E. Ulbig, R. F. Hertel, G.-F. Böl
Kommunikation von Risiko und Gefährdungspotenzial aus Sicht verschiedener Stakeholder
Abschlussbericht
€ 10

02/2010 Edited by E. Ulbig, R. F. Hertel, G.-F. Böl
Evaluation of Communication on the Differences between „Risk“ and „Hazard“
Final Report
€ 5

03/2010 Edited by A. Epp, R. F. Hertel, G.-F. Böl
Chemie im Alltag
Eine repräsentative Befragung deutscher Verbraucherinnen und Verbraucher
€ 10

04/2010 Edited by G.-F. Böl, A. Epp, R. F. Hertel
Wahrnehmung der Nanotechnologie in internetgestützten Diskussionen
Ergebnisse einer Onlinediskursanalyse zu Risiken und Chancen von Nanotechnologie und Nanoprodukten
€ 10

05/2010 Edited by A. Epp, S. Kurzenhäuser, R. Hertel, G.-F. Böl
Grenzen und Möglichkeiten der Verbraucherinformation durch Produktkennzeichnung
€ 15

06/2010 Edited by M. Hartung
Erreger von Zoonosen in Deutschland im Jahr 2008
Mitteilungen der Länder zu Lebensmitteln, Tieren, Futtermitteln und Umweltproben
€ 15

07/2010 Edited by A. Epp, B. Michalski, U. Banasiak, G.-F. Böl
Pflanzenschutzmittel-Rückstände in Lebensmitteln
Die Wahrnehmung der deutschen Bevölkerung – Ein Ergebnisbericht
€ 10

08/2010 Edited by G.-F. Böl, A. Epp, R. Hertel
Perception of Nanotechnology in Internet-based Discussions
The risks and opportunities of nanotechnology and nanoproducts: results of an online discourse analysis
€ 10

09/2010 Edited by René Zimmer, Rolf Hertel, Gaby-Fleur Böl
BfR Delphi Study on Nanotechnology –
Expert Survey of the Use of Nanomaterials in
Food and Consumer Products
€ 10

10/2010 Edited by René Zimmer, Rolf Hertel, Gaby-Fleur Böl
Risk Perception of Nanotechnology - Analysis of Media Coverage
€ 10

The publications in the BfR-Wissenschaft series are available from:

Federal Institute for Risk Assessment
Press Office
Thielallee 88-92
D-14195 Berlin

Fax: 030-18412 4970
Email: publikationen@bfr.bund.de