

6. Conclusions (Ortwin Renn and Michael M. Zwick)

Discussion of empirical results

The overall picture emerging from our study reveals some important insights into the mechanisms of risk perception and points to several major implications for risk management as well as risk communication. In addition, the results may lead to a new phase in risk perception research, in particular to new studies that rely on open and qualitative research designs.

In a world characterized by globalized markets and international competition, many analysts assume that the public at least in affluent nations such as Germany would be risk-averse, afraid of innovative technological practices and resistant to new developments and changes (Büchel 1995, Mohr 1996). Our findings do not support this view. Our qualitative data show that the respondents focus primarily on those risks that characterize their everyday life such as traffic accidents, hazards to economic reproduction, risks to their personal health and threats of identity, i.e. the loss of primary social networks. Risks of large technologies such as nuclear power, genetic engineering or electro-magnetic radiation were not mentioned at all when our respondents were openly asked about their first association in connection with the term ›risk‹. The public's semantic image of ›risk‹ is mainly related to every-day experience; more distal and abstract risks come into consideration only when these risks were explicitly mentioned in the qualitative interviews by the interviewer.

In the qualitative interviews and - to a lower extent - in the quantitative survey people made a clear distinction between those risks that they personally feel exposed to and those risks that are of social relevance to the population at large. Thus the juxtaposition of personal versus social risks proved to be a useful distinction when it comes to the prevalence and relative importance of risks in the perception of the respondents (cf. Sjöberg 1996).

Both, our qualitative and quantitative survey data point to different strategies that people employ when coping with risks: Everyday-life risks – such as traffic-accidents - tend to be ›normalized‹, i.e. evaluated as severe but regarded as acceptable and unavoidable. With respect to larger social risk and technological risk, the public refuses to take personal responsibility for their existence as well as their management. To a considerable extent, industry and politics were made responsible and accountable for regulating, controlling and reducing large-scale technological hazards. In the public eye, however, these institutions fail to handle risks in a reliable way, and as a consequence, people express little confidence in most risk managing institutions. Maybe this

loss of trust is also caused or amplified by insufficient risk communication and the lack of opportunities to participate directly in risk management decisions. Since our survey was not focussed on risk communication it did not include questions that could demonstrate whether there were correlations between perceptions and risk communication practices or participatory opportunities. Earlier work of the two authors on the acceptability of new technologies support, however, the hypothesis that confidence in risk management institutions correlates with satisfaction with risk communication performance and opportunities for stakeholder involvement (Renn/Zwick 1997: 87-144).

In general people in our survey displayed much fewer concerns and fears than we had expected from viewing the literature on this subject (for an overview: Slovic et al. 1981, Slovic 1987, 1992, Renn 1990, Rohrman/Renn 2000). This was particularly true for radiation-risks emerging from mobile phones and the respective base stations as well as for the risks stemming from ›mad cow disease‹ (BSE), the two hot issues in Germany in the year 2001. Global climatic change topped the list of respondents' concerns. Although regarded as a high and threatening risk, most respondents acknowledged that the risk of global climate change was off-balanced by the benefits associated with modern life styles, comfort and consumption patterns. In addition, damages resulting from climate change were perceived as being unequally distributed: An actual threat was foreseen for remote areas in the developing world, while the bulk of the population including the German society would be affected in a distant future worsening the living conditions for the following generations. These arguments and perceptions reflect high ambivalence - it even seems that respondents felt like being prisoners of industrial modernization. They obviously enjoy the outcomes of modernization and globalization, but also fear the risks and vulnerabilities that accompany these changes. At the same time, the unequal distribution of benefits and threats over time makes them believe that there is no need for them at this point of time to take personal actions. Possibly, this point of view will become even more popular if the current trend of individualization continues to dominate society (Beck 1999).

The example of the conflict between the perception of serious social risks such as global climate change and the lack of motivation for changes in personal behavior, tends to reinforce the notion of rational action in the classic philosophical sense (Jaeger et al. 2001). Rather than being driven by fear and anxiety we found that respondents showed strong tendency for balancing information on risks and benefits and for designing personal strategies that incorporate time discounting and deal with the dilemma of marginal inputs. When asked to judge the acceptability of risks, people performed a mental balance between expected harm on the one and expected benefits on the other hand. Naturally, the extent to which benefits and potential damages were

assigned to specific risk agents depended on subjective assessments and judgements. We had little evidence that emotional factors such as stigma or symbolic associations exerted a large influence on the perceived seriousness of risk or the perceived risk-benefit balance (see discussion on stigma below). However, one should keep in mind that our attempts to operationalize these emotional factors may have been inappropriate, insufficient or at least incomplete.

If people react so ›rationally‹ in the sense of being able to balance pros and cons, why is there a distinct difference in the evaluation of risks between many technical experts and large segments of the population as indicated by many publications on risk perception (see review in Slovic et al. 1982, Covello 1983, Borchering et al. 1986, Rohrman/Renn 2000)? The answer may lie in the composition of the beliefs that form the arguments for the pros and cons. Whereas most technical experts define risks as a linear combination of probability and harm, most members of the public associate a whole set of situational and hazard-related characteristics with the term risk and use these characteristics as heuristics for perceiving and evaluating risks. Thus, our results do not invalidate studies that point out that social and individual risk perceptions are often in opposition to experts' results of formal risk assessment or environmental impact statements (Allen 1987, Breyer 1993). First, social risk experience seems to be stronger influenced by exposure than by actual casualties on which most risk assessment studies are based (Burns et al. 1993). Second, the survey revealed clearly that people judge the acceptability of risks on the basis of a large set of criteria of which expected benefits and the extent of damage were only two criteria among many others. The criteria on which most people evaluate the seriousness of risk includes value orientations as well as the perception of institutional performance in managing risks. As long as professional risk assessment continues to focus primarily on probability distributions of adverse effects, risk perception will always deviate from the results of technical risk assessment studies.

Beyond any doubt, one can infer from our study as has been confirmed by a multitude of previous studies on the subject that the perception of risk is governed by more than the two dimensions: probability and magnitude of harm. Although risk perceptions differ considerably among social and cultural groups, the multi-dimensionality of risk and the integration of beliefs related to risk, the cause of risk and its circumstances into a consistent belief system, appear to be common characteristics of public risk perception in almost all countries in which such studies have been performed (Rohrman/Renn 2000). Furthermore, the experience of risk is not limited to the threat of facing harm in the future. It includes subjective predictions of possible outcomes, the social and cultural context in which the risk is experienced, the mental images the risk situation evokes, the perception of the players who are involved in the risk situation

and the judgments about fairness and equity related to the distribution of potential hazardous events (Kasperson/Kasperson 1983, Slovic 1992).

In our survey, some of these qualitative characteristics had a high, others only a weak influence on perceived seriousness of risk or the judgment on risk acceptability. Most influential were variables such as personal control, voluntariness of risk-taking or perceived fairness of distribution between those who gain the benefits and those who may suffer the damages. With regard to the judgment on risk acceptability, the most important qualitative characteristic was catastrophic potential. In several cases, the catastrophic potential was almost identical with the perceived seriousness of risk.

Surprisingly, the degree of knowledge (in our survey tested as subjective estimate of feeling informed) was quite a weak predictor for risk acceptability and failed the regression test for being included into the multivariate models. This finding is irritating in light of the previous risk perception work, since knowledge is one of the classic items, deemed important throughout the history of risk-perception studies (cf. Gould et al. 1988, Slovic 1992). More recent investigations, however, reflect inconsistent empirical findings and claim a more complex relationship between risk perception and knowledge (see in particular Schütz et al. 2000). This finding will also disappoint those economic and political stakeholders who believed that education programs to enhance public knowledge could change risk perceptions in one or another direction. Knowledge, however, is only marginally related to the judgment of risk acceptability. Thus undertaking educational projects to shape risk acceptability will probably be in vain.

With respect to the *causal models* between risk acceptability and a set of independent variables, we encountered a strong relationship between the classic qualitative variables and the judgement about acceptability as we had indicated above. We were able to reproduce the influence of many qualitative risk characteristics that Slovic et al. had identified, and were supported by other studies (for example: Vlek/Stallen 1981, Gould et al. 1988, Borchering et al. 1986, see review in Rohrman/Renn 2000). However, path analyses revealed considerable differences in the configuration of variables explaining risk acceptability. First, qualitative risk characteristics explain much, but by far not everything with respect to both perceived seriousness of risk and risk acceptability. In particular, when new risks such as genetic engineering or the radiation risks from mobile phones and transmitter stations were appraised by the respondents, the variable *institutional trust* – operationalized as satisfaction with perceived managerial performance – proved to be a strong predictor. In contrast to this specific result, the degree of generalized trust or confidence played only a moderate role in explaining risk acceptability with respect to most of the other risks included in our survey. The debate over the importance of trust for risk perception has remained controversial over

the years (Kasperson et al. 1992, Slovic 1993, Earle/Cevtkovich 1995, Sjöberg 1996, 1997). Sjöberg's investigations, for example, indicate that trust seems to be of less importance than often assumed. However, we have used a different concept of trust (perceived performance) while Sjöberg's analyses rely on the concept of credibility (Sjöberg 1997). In addition, the differences may be caused by different interpretations of what is regarded as a low or high correlation. Our direct correlations between risk acceptability and trust in politics or industry range between .25 and .48 thus reflecting a significant but not overly strong connection. We should emphasize, however, that in our survey trust turned out to be the second most important predictor for risk acceptability after the qualitative characteristics.

More abstract risks like climatic change and risks with high mobilization potential such as nuclear energy, show a significant but not dramatic association with the *value orientations* of the respondents. In the study we had included three different scales for testing value orientations. Only one of the three concepts yielded adequate results. Inglehart's materialism-postmaterialism scale did not perform well on any of the risk agents included in our study. Due to its narrow conception of values and sparse operationalization, the test scale resulted in more than 60% unclassifiable cases and accounted for too little of the variance in socio-cultural differentiation in order to explain risk perception. The same was true for the scale of cultural prototypes designed by Dake and others (Wildavsky/Dake 1990). The empirical test in our survey did not produce any relationships between the cultural prototype scale and acceptability of risk for any of the risk agents included in our study. There was no single case in which the scale value exceeded the default threshold for entering into the regression model. On this point we agree with Sjöberg (1997) that the explanatory value of the cultural prototypes has been overrated in some of the risk literature (Rayner 1990, Thompson et al. 1990, Schwarz/Thompson 1990). Most studies on the empirical relevance of these cultural prototypes that were not performed by the 'true believers' show small to moderate correlations (Sjöberg 2000).

The last scale designed by one of the authors, Michael Zwick, showed a modest amount of explanatory value. As most respondents voiced temperate, sometimes sceptical or ambivalent positions towards the various risks included in our study, distinctive value patterns are expected to be of only minor importance to explain composite and differentiated risk judgements. This expectation was confirmed when looking at the results of the Zwick scale. If respondents had high scores on extreme value clusters – such as belonging to the group of modernization-critical alternatives on one hand or to the liberal upward orientated technocrats on the other hand – one could detect reasonable correlations between these value commitments and a rather sceptical respectively positive judgement of risk acceptability. The scores for the other

value groups in between the two extremes failed to discriminate among the different levels of acceptability.

Another class of predictors that we investigated referred to *stigma* effects (Kasperson et al. 1988, Slovic et al. 1991, Gregory et al. 1995, Flynn et al. 2001). We tried to test for such effects, but we were not able to detect any statistically significant results. We had operationalized stigma by juxtaposing frightening images of the risk with verbal ›neutral‹ terms in a split-half design: We presented one half of the total sample with the images, the other half with the verbal descriptions (shown in the appendix). There was no significant change in responses for any of the risks covered by the survey. We are not sure, however, whether images do indeed evoke more stigma impulses than verbal descriptions. If they do, they certainly had no effect on the perceived acceptability of risk. Possibly, our operationalization was inadequate, possibly none of the risks included in the survey were actually stigmatized at the time of data collection. Stigmatization is highly dependent on situational context, as for example media coverage, which might induce an avalanche-like emergence of panic and subsequently avoidance of risk-related locations, technologies or products. We assume that stigma effects are less potent as soon as other social issues such as blame, manageability or accountability dominate the public debate. During the winter months of 2000/2001, for example, consumption of beef dropped dramatically due to the fear of BSE. At the time when we started data collection in the middle of February 2001, people had already become more familiar with the threat of BSE and started to worry more about management options and health protection. In addition, no case of the new form of Kreuzfeldt-Jacob disease (a fatal illness linked to the consumption of BSE-contaminated beef) was detected in Germany, what made the threat less severe. Many people also felt that the government was reacting to the threat and protective measures had been taken. Starting with February 2001, consumption of beef increased to normal levels again. During the data collection period there were no other hot spots within the broad risk debate that we expected could cause considerable stigmatization. Perhaps the failure of finding stigma effects in our data set indicates how short-lived emotional reactions to a new threat have become in modern life.

Another class of independent variables include the personal dispositions to take or reject risks. In our survey personal dispositions played a role only when the respondents evaluated voluntary risks such as smoking. These examples prove, that - in contrast to Sjöbergs hypothesis (1997) - also ›distal‹ variables such as values, trust or personal dispositions may contribute some explanatory power. Last, not least our multivariate analysis demonstrated that all measured *socio-demographic characteristics* had also no explanatory power with respect to risk acceptability.

This result is not surprising. In the course of modernization and globalization, the German population has been moving along the trajectory of individualization and differentiation (Luhmann 1990, Beck 1999). Rather than aligning oneself to traditional class structures or belonging to a specific social stratus, most people move within a diverse spectrum of socio-cultural and socio-economic milieus (over time and space), while traditional institutions of class and social status as well as stable social reference groups have lost importance in society. Subsequently one can expect increasing heterogeneity among public orientations. This, in turn, explains the diminishing influence of socio-demographical variables for explaining attitudes or risk perceptions.

Consequences for future research on risk perception

Risk perception variables have been the focus of many studies in the past. The vast literature on biases in processing probabilities (Ross 1977, Tversky/Kahneman 1976) and in identifying lists of qualitative risk factors (Slovic et al. 1981, Vlek/Stallen 1981, Renn 1990) suggest that most people, including experts, have difficulties in dealing with stochastic events and use a variety of qualitative dimensions for making judgments about risks. Our study supports this claim to a large degree, but shows also that these relationships are embedded in a larger context of perceived institutional competence, social influences, and personal life situations. Looking over the array of results from the qualitative and quantitative studies we can draw the following insights:

First, our qualitative data revealed some interesting semantic images of risks and provided valuable insights into the life-world surrounding risk perception. The narrative interviews indicated that the cognitive presence of risk starts with the mental relationship between the risk and the individual respondent. People associated with the term ›risk‹ common threats linked to their daily activities and their personal life-world such as health care, the potential loss of primary networks, traffic accidents or problems of socio-economic reproduction. Thus qualitative data is an indispensable corrective to quantitative survey data, since it sheds light on the different levels of experiencing risk in everyday life and points to the importance of coping strategies that allow individuals to navigate through the waters of uncertainty and ambiguity. Quantitative survey data does not grasp this dimension adequately because the measurement of this dimension depends on the capability of the research instrument to put risk in the context of the life-world of each individual respondent. Often, survey data reflects no more than responses to pre-given stimuli (those are often social and/or technological risks since most funding organizations have most interest in these issues), while qualitative data – if done properly - focuses on the context in which risk is shaped by individual experiences in everyday life. It was also a surprise for us that technological risks played such a minor role in the public's intuitive understanding

of risk. Only when large-scale technological risks were mentioned to the respondents they did place them into the risk portfolio.

Second, our questionnaire included lots of variables that we hypothesized to be powerful predictors for risk perception, evaluation and acceptability. From a methodological point of view, two insights are of relevance here:

- A listwise question-design will normally produce answers to every stimulus presented to the respondents, irrespective of the relative importance and cognitive representation of the issue within each individual's mental model. This tendency to provide some kind of reaction to each stimulus even if the reaction is constructed at the time of the interview can be partially overcome by asking respondents to rank-order choices or activities. We asked our respondents, for example, to rank-order six places with different risk profiles (question: if you were forced to move which one would you select?). One of the risks, exposure to crime, appeared completely inconspicuous in the list mode of responses (since most people felt being safe in their neighborhood), but gained a protruding importance when it was used as a qualifier for making a rank-order of places to move to. People were not overly concerned with crime in their present location, yet when asked to rank six locations with different risk profiles, four out of ten interviewees gave the location with a higher than normal crime rate last priority. This example demonstrates the importance to include different methodological concepts and operational designs into the questionnaire, each of them displaying specific advantages and shortcomings.
- It turned out to be advantageous to include in one survey instrument five different concepts explaining risk perception and acceptability. Although the explanatory power of each concept depends clearly on the quality of the operationalization of each class and a single survey may not be adequate to cover all five concepts in full depth, the decision to place them together in one survey offered the unique opportunity to test each concept's explanatory value in a variety of multivariate competitive models. One of the most interesting findings is that there appears not a unique pattern explaining the acceptability of all the risks covered in our study, but rather different profiles of explanatory power for each specific risk. Personal and voluntary risks, for instance, were perceived quite differently from global risk or risks emerging from new and not yet well-known or managed technologies. This result provides new insights for better concepts of risk communication as well as political participation in risk-related matters, since general models for communication and participation may need to be fine-tuned or even tailored in line with the distinct perception patterns of the risk in question.

The role of risk perception for policy making

What is the practical relevance for risk perception studies such as the one that we described in this paper. The ordinary view here is that public knowledge is always thought to be inferior to the systematic knowledge of the experts and that the experts should not place their values into the decision process (more politely phrased in Breyer 1993). Several decades of participation research and its critical evaluation have demonstrated that such a simple division does neither work nor does it do justice to perceptions or expertise (Wynne 1989).

In many decision making contexts, anecdotal knowledge is often as important as the systematic knowledge of experts, and the reflections of experts are most often a valuable input for the evaluation of options. At the same time, however, all knowledge claims need to be tested against the accepted rules of methodology, as well as all value judgments need to reflect the distribution of the potentially applicable values within the affected population (Kunreuther/Slovic 1996). The two criteria ›truth‹ (as fuzzy as it may even appear in many scientific contexts) and ›representativeness‹ are neither interchangeable nor replacable by each other. All collectively binding decisions need to meet both criteria. Democratic societies need procedures of conflict resolution if the two criteria suggest different options as it is often the case in decisions on risk issues.

From this normative position it is obvious that decision makers should not use risk perceptions as normative guidelines for managing risks. Perceptions are partially based on false knowledge claims, cognitive biases, distortions, and non-generalizable anecdotal evidence (Breyer 1993, Okrent 1998, Sjöberg 2001). Having said this, one should also acknowledge, however, that these experts do not represent the scope of values and interpretations that characterize the horizon of legitimate values within the affected population. Any decision on the acceptability of a given risk implies crucial value judgments on three levels. The first set of value judgments refers to the list of criteria on which acceptability or tolerability should be judged, the second set of value judgments determine the trade-offs between criteria, and the third set of values should assist in finding resilient strategies for coping with remaining uncertainties (Renn 1998). Using methods of public participation on all three value inputs does not place any doubt on the validity and necessity of applying the best of technical expertise for defining and calculating the performance of each option on each criterion. Public input is an essential contribution for determining the objectives of risk policies and for weighing up the various criteria that ought to be applied when evaluating different options. To know more about perceptions can help to create a more comprehensive set of decision options and to provide additional anecdotal knowledge and normative criteria to evaluate them.

The necessity to base risk decisions on plural value discourse has been highlighted in a report by the U.S. National Academy of Sciences (Stern/Fineberg 1996) which emphasized an *analytic-deliberative process*, by which technical expertise and public value input should be integrated. Democratic values can provide the means to construct this dialogue and the social science perspectives can help to make these forms of dialogue work, i.e. to make sure that each group can bring their own interests and values to the process and yet reach a common understanding of the problem and the potential solutions (Fiorino 1989).

The crucial question in risk management is not who is justified to make decisions but what rationale is used when imposing risks on others and making choices with far-reaching consequences under the condition of uncertainty (Webler/Renn 1995). Studying risk perceptions can assist risk managers by providing the legitimate concerns and dimensions that people associate with different risk sources (Webler 1995). They also can demonstrate the potential trade-offs that people would make in setting priorities for their life. But they cannot replace scientific judgment about the nature and likelihood of the consequences of human actions nor the political accountability of those elected officials who have been legitimately appointed to make responsible choices. What is needed is an integration of knowledge, public preferences, and political responsibility (Jasonoff 1993). The study of perceptions is one important input towards such an integration.

Literature

- Allen, F.D. 1987: Towards a Holistic Appreciation of Risk: The Challenge for Communicators and Policymakers. *Science, Technology, and Human Values*, 12, Nos. 3 & 4: 138-143.
- Beck, U. 1999: *What is Globalization*. Cambridge, UK.
- Borcherding, K., Rohrman, B. and Eppel, T. 1986: A Psychological Study on the Cognitive Structure of Risk Evaluations, in: B. Brehmer, B., Jungermann, H., Lourens, P. and Sevon, G. (eds.): *New Directions in Research on Decision Making*. Amsterdam: 245-262.
- Breyer, S. 1993: *Breaking the Vicious Circle. Toward Effective Risk Regulation*. Cambridge.
- Büchel, K.H. 1995: Erfolgsgarant Nr. 1: Innovationsfähigkeit. In: *Fonds der Chemischen Industrie* (ed.): *Chemie Heute*, Ausgabe 1994/1995: 4-5, Frankfurt a.M.

- Burns, W.J., Slovic, P., Kasperson, R.E., Kasperson, J.X., Renn, O., and Emani, S. 1993: Incorporating Structural Models into Research on the Social Amplification of Risk: Implications for Theory Construction and Decision Making. *Risk Analysis*, Vol. 13, No. 6: 611-623.
- Covello, V.T. 1983: The Perception of Technological Risks: a Literature Review. *Technological Forecasting and Social Change*, 23: 285-297.
- Earle, T.C. and Cvetkovich, G. 1995: *Social Trust: Towards a Cosmopolitan Society*. Westport, CT.
- Fiorino, D.J. 1989: Technical and Democratic Values in Risk Analysis. *Risk Analysis*, 9, No. 3: 293-299.
- Flynn, J., Slovic, P. and Kunreuther, H. (eds.) 2001: *Risk, Media and Stigma*. London
- Gould, L.C., Gardner, G.T., DeLuca, D.R., Tiemann, A., Doob, L.W., and Stolwijk, J.A.J. 1988: *Perceptions of Technological Risks and Benefits*. New York.
- Gregory, R., Flynn, J., and Slovic, P. 1995: Technological stigma. *American Scientist*, 83: 220-223.
- Jaeger, C.C., Renn, O., Rosa, E. and Webler, T. 2001: *Risk, Uncertainty and Rational Action*. London.
- Jasanoff, S. 1993: Bridging the Two Cultures of Risk Analysis. *Risk Analysis*, 13, No. 2: 123-129.
- Kasperson, R.E. and Kasperson, J.X. 1983: Determining the Acceptability of Risk: Ethical and Policy Issues, in: J.T. Rogers and Bates, D.V. (eds.), *Assessment and Perception of Risk to Human Health*. Conference Proceedings, Royal Society of Canada, Ottawa: 135-155.
- Kasperson, R., Renn, O., Slovic P., Brown, H., Emel, J., Goble, R., Kasperson, J.X., and Ratick, S. 1988: The Social Amplification of Risk. A Conceptual Framework. *Risk Analysis*, 8, No.2: 177-187.
- Kasperson, R., Golding, D. and Tuler, S. 1992: Social Distrust as Factor in Siting Hazardous Facilities and Communicating Risks. *Journal of Social Sciences*, 48: 161-187
- Kunreuther, H. and Slovic, P. 1996: Science, Values, and Risk, in: *Annals of the American Academy of Political and Social Science*, Special Issue. H. Kunreuther and P. Slovic (eds.), *Challenges in Risk Assessment and Risk Management*. Thousand Oaks: 116-125.
- Luhmann, N. 1990: Technology, Environment, and Social Risk: A Systems Perspective. *Industrial Crisis Quarterly*, 4: 223-231.
- Mohr, H. 1996: Die Akzeptanz des technischen Fortschritts – wo liegen die Probleme? *Atomwirtschaft*, Heft 7: 346-350.
- Okrent, D., 1998: Risk Perception and Risk Management: On Knowledge, Resource Allocation and Equity. *Reliability Engineering & Systems Safety*, 59: 17-25.
- Rayner, S. 1990: *Risk in Cultural Perspective: Acting under Uncertainty*. Dordrecht.

- Renn, O. 1990: Risk Perception and Risk Management: A Review. *Risk Abstracts*, 7, No. 1: 1-9 and 7, No. 2: 1-9.
- Renn, O. 1998: The Role of Risk Communication and Public Dialogue for Improving Risk Management. *Risk Decision and Policy*, Vol. 3, No. 1: 5-30.
- Renn, O. and Zwick, M. M.: *Risiko- und Technikakzeptanz*. Berlin.
- Rohrmann, B. and Renn, O. 2000: Introduction, in: Renn, O. and Rohrmann, B. (eds.): *Cross-Cultural Risk Perception*. Dordrecht: 5-32.
- Ross, L.D. 1977: The intuitive psychologist and his shortcomings: Distortions in the Attribution Process, in: Berkowitz, L. (ed.): *Advances in Experimental Social Psychology*, Vol. 10. New York: 173-220.
- Schwarz, M. and Thompson M. 1990: *Divided We Stand: Redefining Politics, Technology, and Social Choice*. Philadelphia.
- Schütz, H., Wiedemann, P.M. and Gray, P. 2000: Risk Perception beyond the Psychometric Paradigm. Heft 78 zur Risiko-Kommunikation, Forschungszentrum Jülich.
- Sjöberg, L. 1996: A Discussion of the Limitations of the Psychometric and Cultural Theory Approaches to Risk Perception. *Radiation Protection Dosimetry*, 68: 219-225.
- Sjöberg, L. 1997: Explaining Risk Perception: An Empirical Evaluation of Cultural Theory. *Risk Decision and Policy*, 2: 113-130.
- Sjöberg, L. 2000: Factors in Risk Perception. *Risk Analysis*, 20: 1-11.
- Sjöberg, L. 2001: Political Decisions and Public Risk Perception. *Reliability Engineering & System Safety*, 72, 115-123.
- Slovic, P. 1987: Perception of Risk, *Science*, 236, No. 4799: 280-285.
- Slovic, P. 1992: Perception of Risk: Reflections on the Psychometric Paradigm, in: Krimsky, S. and Golding, D. (eds.): *Social Theory of Risk*. London: 117-152
- Slovic, P. 1993: Perceived Risk, Trust and Democracy. *Risk Analysis*, 13: 675-682
- Slovic, P., Fischhoff, B., and Lichtenstein, S. 1981: Perceived Risk: Psychological Factors and Social Implications, in: *Proceedings of the Royal Society*, A376, London: 17-34.
- Slovic P., Fischhoff B. and Lichtenstein, S. 1982: Why study risk perception? *Risk Analysis*, 2: 83-94.
- Slovic, P., Layman, M. and Flynn, J. 1991: Risk Perception, Trust, and Nuclear Power: Lessons from Yucca Mountain. *Environment*, 33: 6-11 and 28-30.
- Stern, P.C. and Fineberg, V. 1996: *Understanding Risk: Informing Decisions in a Democratic Society*. National Research Council, Committee on Risk Characterization. Washington, D.C.
- Thompson M., Ellis W. and Wildavsky A. 1990: *Cultural Theory*. Boulder.

-
- Tversky, A. and Kahneman, D. 1975: Judgement under Uncertainty. Heuristics and Biases, in: D. Wendt and C. Vlek (eds.): *Utility, Probability and Human Decision Making*, Dordrecht: 141-162.
- Vlek C.A.J. and Stallen P.J. 1981: Judging Risks and Benefits in the Small and in the Large. *Organizational Behavior and Human Performance*, 28: 235-271.
- Webler, T. 1995: ›Right‹ Discourse in Citizen Participation. An Evaluative Yardstick, in: Renn, O., Webler, T. and Wiedemann, P.M. (eds.): *Fairness and Competence in Citizen Participation. Evaluating New Models for Environmental Discourse*. Dordrecht: 35-86.
- Webler, T. and Renn, O. 1995: A Brief Primer on Participation: Philosophy and Practice, in: Renn, O., Webler, T. and Wiedemann, P.M. (eds.): *Fairness and Competence in Citizen Participation. Evaluating New Models for Environmental Discourse*, Dordrecht: 17-34.
- Wildavsky, A. and Dake, K. 1990: Theories of Risk Perception: Who Fears What and Why? *Daedalus*, 119: 41-60.
- Wynne, B. 1989: Sheepfarming after Chernobyl, *Environment*, 31: 11-15, 33-39.