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CHERNOBYL: FOUR YEARS LATER: ATTITUDES, RISK MANAGEMENT AND COMMUNICATION

J. VAN DER PLIGT* and CEES J. H. MIDDEN†

**Faculteit der Psychologie, Universiteit van Amsterdam, Weesperplein 8, 1018 XA Amsterdam, The Netherlands and †University of Leiden, Centre for Energy and Environmental Research, Dept. of Social and Organizational Psychology, Wassenaalseweg 52, 2333 AK Leiden, The Netherlands*

Introduction

The recent past has shown that major nuclear accidents can have a marked impact upon public attitudes. Immediately following the Three Mile Island accident in 1979, support in the U.S.A. decreased, and opposition towards nuclear energy increased. Although there has been some rebound towards pre-Three Mile Islands levels of support and opposition, the return has not been complete (Rankin *et al.*, 1981). Furthermore, a majority of the U.S. public believes that more such accidents are likely to happen, and a large majority now says that it is concerned about waste management issues (Kasperson *et al.*, 1980). It has been argued that because of the importance of safety aspects in the public's acceptance of nuclear energy, attitudes are more likely to become antinuclear because of a major accident or a series of minor accidents than more pronuclear as a result of a period of safe operations (Van der Pligt & Eiser, 1985).

The reactor accident at Chernobyl on April 25–26, 1986 provided another opportunity to study the impact of major nuclear accidents on public attitudes. As we shall see in this issue, the accident at Chernobyl not only left its mark in the form of radioactive fall-out in a variety of European countries, but also had a lasting impact on public opinion, personal attitudes and public policy.

Public attitudes towards nuclear energy tend to be dominated by safety considerations. This led to a substantial research effort to investigate the possible role of risk perception in public acceptability of nuclear energy. The role of risk perception as a possible antecedent of the limited public acceptability of nuclear energy has also been studied in the context of nuclear accidents.

Another research area of relevance to the study of public reactions to nuclear accidents is concerned with the role of decision style and coping with uncertainty. These issues have been investigated in the context of the accident at Three Mile Island (Baum, Fleming & Singer, 1982) and other environmental hazards (de Boer, 1986*a*). In this issue a number of contributors will present data related to decision style and coping with uncertainty.

A third area of relevance is concerned with public opinion processes. Public attitudes towards nuclear energy have been extensively studied since the mid-1970's. The present issues include comprehensive overviews of public opinion shifts due to the Chernobyl accident in a wide variety of countries.

Finally, accidents like that at Chernobyl do have important consequences for public

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policy. Chernobyl has provided lessons for both risk management and risk communication. In the following pages we will briefly introduce these four aspects—risk perception, decisions and coping with uncertainty, public opinion, and risk management and communication—and relate these to the contributions included in the issue.

Risk Perception

Although the experts' assessments of a variety of technological risks indicate that these are not greater than, and perhaps substantially less than, those of other generally accepted risks, the public distrust of some technological risks is considerable. The issue of risk perception has been extensively studied in recent years, partly with the aim of helping to formulate policy decisions on risk regulation and risk-bearing technologies. Several studies have attempted to establish whether the public's intuitive assessments are related to the expected losses criterion used in technical risk assessments. Apart from an overestimation of risks with low expected losses and an underestimation of risks with high expected losses, the intuitive assessments of lay people do not seem that far from reality (Daamen *et al.*, 1986). This led to the necessity of focusing on other possible explanations for the limited public acceptance of the risks associated with certain technologies (nuclear energy, chemical industries, hazardous waste siting).

A number of studies have revealed that the lay public defines risks in much broader terms than the expert. One of the conclusions of this line of research was that, for instance, nuclear energy elicits extraordinary levels of concern, particularly because of the characteristics of the hazards that it poses (Fischhoff *et al.*, 1978). Most prominent among these are the potentially catastrophic and involuntary nature of possible accidents, and the fact that the hazard poses an unknown threat which is difficult to combat. The public's concept of risk, therefore, seems to be heavily influenced by the catastrophic nature of conceivable consequences and a number of qualitative risk characteristics such as voluntariness, possiblities of personal control and the fact that the hazard is relatively unknown.

Drottz and Sjöberg's study focuses on risk perception. Their study was carried out in three regions in Sweden which had been exposed in differing degrees to radioactive fallout. Their findings show significant increases in worry and concern in the 6 months following the accident. Although general attitudes towards nuclear power returned to pre-Chernobyl levels, Drottz and Sjöberg found that groups who were more affected by the accident in their daily lives showed more extreme increases in worry, concern and anxiety. Similar findings were obtained in the Three Mile Island area after the accident in 1979. Drottz and Sjöberg also investigated stress-related reactions of people in areas affected by the accident at Chernobyl. This brings us to another research area of relevance to the study of public reactions to nuclear accidents, i.e. stress and coping processes.

Decisions and Coping with Uncertainty

Research on a variety of technological hazards underline the importance of chronic stress and coping processes. These factors become more important when people are (or will be) more directly exposed to the risks, for instance when they are confronted with the consequence of a serious nuclear accident or when their locality is shortlisted as a possible site for a hazardous waste facility. Research conducted around Three Mile

Island (Baum *et al.*, 1982) and in residential areas confronted with contaminated soil (Levine, 1982; de Boer, 1986*a*), are just a few examples of a growing field of research that tries to apply findings obtained in research on stress and coping patterns to public reactions to a variety of hazards.

Some of these studies (de Boer, 1986*a*, Eiser & van der Pligt, 1988) attempt to apply Janis and Mann's work to public reactions to environmental and technological hazards. Janis and Mann (1977) mention various coping patterns of which defensive avoidance, hypervigilance and vigilance are particularly relevant in the present context. Awareness of possible serious losses together with loss of hope of finding a satisfactory solution are important conditions for defensive avoidance. Janis and Mann relate defensive avoidance to closed-mindedness and biases in information preference. Examples are the avoidance of information, shifting of responsibility (e.g. leave it to the expert) and selective exposure (preference for information supporting one's viewpoint). Hypervigilance is the most likely strategy when people believe that a satisfactory solution exists, but there is insufficient time to search and deliberate. If this is the case people tend to display an indiscriminate openness to all information and usually fail to differentiate between information that is relevant or irrelevant, reliable or unreliable, supportive or non-supportive. As a consequence the person becomes overwhelmed by information and is bound to experience anxiety and stress due to the decisional stalemate. When the conditions for vigilance are present (i.e. awareness of serious risks, along with a belief that a satisfactory solution can be found and that there is sufficient time to do so), the individual will tend to have a discriminating and open-minded interest in both supportive and opposing information. Janis and Mann argue that the above coping patterns and their relationships with characteristic modes of information processing should improve our understanding of decisional stress. Research on environmental stressors confirms the importance of some of the coping strategies included in Janis and Mann's conflict model for information preferences. Eiser *et al.*, in this issue, attempt to investigate how people deal with information that is threatening and/or inconsistent with existing attitudes and beliefs. In a study conducted in six countries they focus on the cognitive strategies people use to deal with decisional conflict. On the basis of Janis and Mann's (1977) work they study individual differences in decision-making style and relate these to the degree of anxiety and attention created by the Chernobyl accident.

An important contribution of this type of research is that it has shown how people differ widely in the ways they cope with risks and uncertainty, and that some coping patterns are more likely to lead to anxiety and stress-related complaints (Baum *et al.*, 1982, 1983). For instance, in a series of studies in the aftermath of the Three Mile Island accident, Baum and his colleagues investigated people's reactions to this stressful event. Findings suggested that emotion-focused coping and self-blame were associated with less stress than were problem-focused coping and denial. In other words people who chose to attend to their emotional response (i.e. focus inward and attempt to control fears and emotional responses associated with exposure to stress) experienced less stress than people who tended to address the source of stress in order to reduce or remove the threat that was posed. One should take into account that in extreme circumstances such as the immediate aftermath of the TMI accident, the situation is highly resistant to attempts at change by individuals, and those changes that are made usually take a long time. Furthermore, the complexity of the issue and the uncertainties associated with possible consequences lead to the recognition that the situation is

relatively impervious to manipulation or control. In other words, in these specific situations even problem-oriented coping strategies that are 'well balanced' are less effective. Baum *et al.* (1982) emphasize the importance of personal control in public reactions to technological mishaps such as that at Three Mile Island. They argue that the use of emotion-focused coping and the assumption of blame may reflect control-relevant concerns. Concern with emotion management may provide sufficient success to bolster one's general feelings of control. In contrast, the use of problem-oriented coping in situations impervious to manipulation or control may result in frustration and further failures at establishing a sense of control. Furthermore, problem-centred coping is generally related to the denial of responsibilities for one's own difficulties in dealing with the situation. Results indicated that people who denied responsibility for their predicament also reported more feelings of helplessness and less confidence in their ability to control things that happened to them. The latter group also showed higher levels of stress as indicated by self-reports, biochemical measures and task performance (i.e. ability to concentrate).

Results obtained in later studies (Baum *et al.*, 1983) revealed that more than one year after the nuclear accident at Three Mile Island, residents of the area still exhibited more symptoms of stress than did people living under different circumstances. The intensity of most problems seemed 'subclinical', but the possible persistence of stress leading to a chronic aftermath inhibiting recovery may give cause for concern. The samples included in the Eiser *et al.* study varied considerably in proximity to Chernobyl but they deal with far greater distances as compared with the studies by Baum and his colleagues. Unfortunately the study did not include samples in Eastern Europe although strenuous attempts were made to include samples from Poland. The most affected regions included in the present set of studies are those selected by Drottz-Sjöberg and Sjöberg. Not surprisingly, their study focuses more explicitly than most of the others on stress, anxiety and worry and their effects on public attitudes and behaviour.

Public attitudes towards nuclear accidents and to nuclear power in general have been studied extensively since the mid 1970's. This research area is also of importance to the studies presented in this issue.

Public Attitudes

Over the past 15 years, public support for nuclear energy has been gradually eroded. By the early 1980's the percentage of the U.S. public that supported the continued building of nuclear power plants in the United States was, on average, 5% to 10% more than the percentage of the public that opposed such construction (Rankin *et al.*, 1981). The above trends were also apparent in Europe; for instance, opinion polls in The Netherlands and the United Kingdom have shown a slow but steady increase in public opposition to building more nuclear power stations. Opinion polls in both countries show a majority of the general public opposing further expansion of the number of nuclear power stations (Thomas & Baillie, 1982). EC-surveys indicate that, averaged over the 10 member states, 38% of the public favours expansion of nuclear energy with 37% opposing further development (Commission of the European Communities, 1982).

In most Western countries, opinion polls show relatively polarized attitudes and stable proportions of supporters and opponents, with no clear majority on either side

of the debate. Major accidents have had a marked effect upon public opinion. The effects of the Three Mile Island accident (1979) on public attitudes have been documented extensively, especially in the United States (e.g. Nealy *et al.*, 1983). The accident had a major effect on attitudes in the first months following the closure of one of the reactors at the site. The level of public support for nuclear power decreased by 15–20%. Between the third and sixth month, some recovery was observed in the polls, after which the acceptance level of nuclear power stabilized again, but on a level 10–15% lower than before the accident. The major shift concerned neutral attitudes which were becoming more negative. The number of supporters hardly decreased. It seemed that positive attitudes towards nuclear power, apart from the initial reactions, appeared sufficiently stable to resist strong counter-attitudinal information. Neutral attitudes changed considerably in a negative direction, and negative attitudes were reinforced (Nealy *et al.*, 1983).

The effects of the accident at Chernobyl seem rather similar (c.f. Sjöberg & Drottz, 1987; Hohenemser & Renn, 1988; McDaniels, 1988; Eiser *et al.*, 1989; Verplanken, 1989). Renn and Hohenemser (1987) hypothesize that reactions may differ from country to country dependent on the level of commitment of the public; in countries with well-formed attitudes such as the U.S.A., the U.K. or The Netherlands effects might be smaller and recovery stronger than in countries with a large fraction of uncommitted citizens. This conclusion seems consistent with the suggested explanations of the Three Mile Island effects.

A number of articles in the present issue deal with public opinion to nuclear energy in general. Peters, Albrecht, Hennen and Stegelmann give a detailed account of attitude- and opinion shifts in the Federal Republic of Germany in the two years after the accident at Chernobyl. Renn compares public opinion in a wide variety of countries before, directly after and one year after the accident. Midden and Verplanken conducted a detailed study on attitude and opinion shifts over a two year period. They followed individual attitudes over time and argue that within-subjects comparisons are far more informative than the usual overall comparisons at various moments in time. Their analysis revealed that specific beliefs of their respondents tended to be less stable than more general attitudes. Furthermore, supporters of nuclear energy appeared to have less stable attitudes than opponents.

Attempts to analyse the structure of people's attitudes towards technological risks are usually based on expectancy-value models of attitude formation which broadly assume that the more a person believes the attitude object has good rather than bad attributes or consequences, the more favourable his or her attitude tends to be. Results of these studies show that individual attitudes are based upon perceptions of a limited number of potential negative and positive aspects. Furthermore, opponents and supporters of nuclear energy tend to base their attitudes on different aspects of the issue. Drottz and Sjöberg's findings confirm this. Midden and Verplanken show that the two groups (opponents vs supporters) also differ in ambivalence and hence in attitude stability.

All in all, most of the studies included in this issue show that public acceptability of nuclear energy is not only related to their perception of the risks involved. Public acceptability is built on values, attitudes and sets of attributes which need not be similar to the representation of the expert and those involved with risk management. This brings us to two other aspects of nuclear accidents, i.e. the management of risks and risk communication.

Risk Management and Communication

A consequence of the public's continued concern about a variety of environmental risks is that recent research efforts focus on attempts to inform and educate people about risk. An important conclusion of risk perception research concerns the presentation of quantitative risk estimates of various hazards. Presentation of these estimates expressed in some unidimensional index such as annual probability of death or reduction in life expectancy are not likely to help bridge the gap between experts and the public. People's attitudes and perceptions are determined not only by these sort of unidimensional statistics but also by the various qualitative characteristics described earlier in this section. Moreover, risk debates are not merely about risk but are often related to other social or ideological concerns. In this context statements such as 'the risk from the Chernobyl fall-out is equivalent to crossing your local high street twice a week' give inadequate consideration to important differences in the nature of the two risks. It seems necessary, therefore, to use a broader conception of risk when attempting to characterize, compare, communicate *and* regulate risks. Fischhoff *et al.* (1984) have attempted to develop a more comprehensive measure of risk and have shown that variations in the scope of one's definition of risk have a considerable influence on the assessment of a variety of environmental risks. Generally, knowledge about many issues relevant to risk communication is rather limited. The issue of risk communication and risk management is extensively discussed in Renn's contribution. His analysis shows that most countries had no emergency plan for coping with this type of transnational accident. Too often this has led to inconsistent and confusing risk management programmes. Given all the confusion about protective actions it does not seem surprising that many people overreacted while others did not even follow basic and simple recommendations. Renn discusses both the role of the media in these processes and the effects on people's trust in emergency planning agencies. Finally he attempts to develop some guidelines for risk management and communication. Some of the institutional reactions he describes could be categorized under the heading 'defensive avoidance' discussed in the first two papers of this issue.

As far as risk communication is concerned the task seems to be two-fold. Firstly, risk communication should address the general issue of technological risks. It seems necessary to include qualitative aspects in risk communication and thus take the public's frame of reference more seriously. Genuine attempts have been made to adapt to the public's perception of the risks, however, most risk communication still focuses entirely on quantitative risk assessments. This usually leads to complicated technical accounts of the possible risks. The authorities tend to explain this strategy as being caused by the high level of uncertainty of risk assessment techniques. The complicated technical accounts of possible long-term effects and interactive effects, however, are difficult to translate into terms understandable to lay-people.

As a consequence, people remain in an extremely uncertain situation. The resulting fear of unknown consequences is sometimes exacerbated by conflicting and often tentative messages from a wide variety of sources. Too often people are subject to conflicting messages from the authorities. Reducing this lack of consistency is the second major task of risk communication programmes.

Since safety and health related issues play a crucial role in public acceptance of policy solutions, it seems necessary to improve the relationship between the expert and the lay public. For the experts this poses an important challenge: to recognize the

limitations and fallability of risk assessments, to provide clear understandable information notwithstanding the high levels of uncertainty, and to be aware of the fact that important, qualitative aspects of risk influence the responses of lay people. For lay people it seems necessary to accept the necessity to be better informed and to be aware of the influence of these qualitative aspects.

The high level of concern and involvement of residents of people confronted with nuclear accidents poses a further challenge to risk communication. Earle and Cvetkovich (1985) point at the importance of developing a common framework appropriate to the particular hazard and acceptable to all involved parties. Development of this framework is a necessary condition for risk communication to be successful (e.g. information about the specific risks for public health and the environment, information about possible ways to reduce the effects of the hazard). Experience has shown that communication about risks is extremely difficult and often frustrating to those involved. Government officials and experts frequently complain about the lack of understanding of lay people and the distorted and biased media coverage. Individual citizens, on the other hand, often perceive a lack of interest in their concerns, and a reluctance to allow them to participate in decisions that intimately affect their lives.

Present evidence also suggests that different aspects are of importance at different stages in the decision-making process. Awareness of the worries, anxieties and information needs at the various stages in the decision-making process could help to improve risk communication efforts, prevent unnecessary effects on people's well-being and lead to less polarized relations. Furthermore, improved communication could increase the degree of trust in the authorities dealing with the hazard.

It seems that in order to understand reactions to environmental hazards such as nuclear accidents, both cognitive aspects such as risk perception and perceived importance of costs and benefits, as well as emotional aspects such as stress related reactions and coping styles should be taken into account. The above discussion suggests that public reactions may also be a function of the characteristics of policy decision *processes*. Lack of public acceptance of risk management recommendations could well be related to the limited *public understanding* due to insufficient *communication* between the experts (and relevant authorities) and the public. Hopefully, the present issue makes a contribution to improving both risk management and risk communication in case of major environmental accidents.

Brief Overview

The following articles in this issue deal with all four aspects described in the previous pages. Drottz and Sjöberg focus on public reactions of high risk groups in areas affected by the Chernobyl accident. Sweden was more affected by the fallout than most other Western European countries, hence the focus on risk perception and coping patterns. Eiser and his colleagues focus on the effects of more general decision styles and attitudes on reactions to Chernobyl. Their study also investigates the role of distance and political preferences on reactions to the accident by comparing samples from various Western European countries and Australia. Midden and Verplanken focus on public attitudes in The Netherlands and present a longitudinal study on attitude change and attitude stability. Peters and his colleagues present a detailed account of attitude- and opinon shifts in the Federal Republic of Germany. Their study

also deals with institutional reactions to the accident. This theme is picked up again by Renn who discusses the role of the media and other relevant agencies. Both risk management and risk communication strategies are being reviewed. Renn ends with a discussion of factors that could improve risk management and communication in the context of major nuclear accidents.

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