

MAJOR ACCIDENT PREVENTION RISK COMMUNICATION EFFECTIVENESS: A SURVEY IN THE CZECH REPUBLIC

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Research article

Abstract: An effective communication among authorities, citizens and industry is crucial to ensure good awareness of risk and knowledge of adequate reactions in preparedness to major industrial accidents. The present risk communication system in Czech Republic was evaluated by a nationwide survey. The main research was focused on the level of knowledge about risks and appropriate reactions to an accident and on the attitudes towards existing risk communication system. The results of survey indicate that the current system is insufficient and has to be improved to fulfill the requirements of the new Seveso III directive (2012/18/EU) and to secure safety of the citizens.

Keywords: Risk Communication, Major Accident Prevention, Survey, Decision-making, Information leaflet.

Introduction

An effective risk communication is one of the key tools to ensure better public preparedness to major chemical accidents. A substantial part of the EU Seveso III 2012/18/EC directive (amending and subsequently repealing 96/82/EC directive) is dedicated to enhancing risk communication to the public. The requirements are that the communicated messages should be clear and easy to understand and that public participation in environmental decision-making should be enhanced.

In the Czech Republic, the major accident prevention risk communication is governed by Act No. 59/2006 Coll. (Major Accident Prevention Act, as amended) and Decree No. 256/2006 Coll. (as amended). In current practice, the risk communication is most often carried out as a one-off provision of concentrated information by means of an information leaflet issued by regional authority in charge. The obligation is to update the leaflet and the information it contains only in case of significant changes in the establishment or in five-year intervals. The legal obligation for providing information is borne by regional authorities to which the operators are required to provide sufficient information, as defined in Decree No. 256/2006

Coll. The information is provided to all residents and people employed in the emergency planning zone.

At present, the risk communication is carried out only as a fulfillment of legal requirements. Activities beyond the level required by law are not common, whether it be a greater involvement of non-profit sector, operators, communities or the Fire Rescue Service, or the leaflet editing. Information leaflets contain items prescribed by the Decree, but the language used, their extent, layout and structure vary for each regional authority or enterprise. With a few exceptions, the quality of editing is rather low.

Adequate response to the actual type of risk and the type of risk are defined in information leaflets. The risk is most often described as a linear and simple although experiences from chemical accidents, such as those in Enschede, Seveso or Toulouse, show that the nature of risks involved in the prevention of major accidents is very often burdened with large uncertainties and is rather complex than linear. This, according to (Renn, 2008a), implies that written forms of communication, such as leaflets, may not be sufficient and other means of communication may be required.

This assertion could not be neither confirmed nor denied given the fact that no feedback mechanism is

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present in the current risk communication system. As well as the fact that in the current setting the risk communication system is a hierarchical in which citizens are at the lowest level and their role consists in the obligation to obey orders and get rescued. This setting contradicts the principle of resilience enhancement asserted by Conception of Protection of Population until 2020 with an Outlook to 2030 (MV-GRHZS ČR, 2013) and such hierarchical systems are also criticized, because it disregards the fact that people will always respond and, in the event of a disaster, it is the citizens who rescue most victims. (Dynes, 1994; Hesloot and Ruitenbergh, 2004)

In such setting, the risk communication system is often based on the assumption that if the population behaves differently than prescribed, it is due to ignorance and lack of information and it is assumed that the amount of information needs to be increased then. This way of understanding communication was described by Hilgartner (Hilgartner, 1990) as “information deficit model” and as such has been disproved. Risk communication is to be perceived as complicated process that involves uncertainties and ambivalent values and it must be built on mutual trust, reciprocity and transparency. Only then rational arguments can be presented and appropriate behavior recommended. (Renn, 2008b; Frewer, 2004)

In the current practice, it is not clear whether the risk communication is meeting its objectives and to what extent the existing system is effective. Our goal was to fill this gap and to assess the actual level of public awareness and attitudes of the public toward the current risk communication system in the Czech Republic.

Setting of Research hypotheses

Risk communication is a highly complex and dynamic process, the exploring of which is far from complete and on which there is currently no clear consensus. The most commonly used communication model (Kaminski, 2008) defines communication as a system consisting of a sender, recipient, message; and communication noise. The goal of this system is the transmission of information in the most comprehensible way possible. All this is also true in risk communication; however, the specificity of risks and the effort to avoid them add further goals risk communication should pursue.

According to Renn, Kasperson and Covello (Renn, 2008a; Kasperson, 1988; Covello, 1989) the goal of every risk communication process is: to reach understanding between the sender and the recipient

of the message and to provide an environment that supports it; to convince message receivers to change their attitudes and behavior in relation to the nature of the risk; provide conditions for rational debate regarding the risks so that all stakeholders could participate in an effective and democratic resolution of possible conflicts; and to build trust between institutions and the general public.

In view of the above findings, two basic research objectives were defined: to assess the level of public awareness and to identify the attitudes the population adopts toward the risk communication system.

Awareness was defined according to Liew (Liew, 2007) as a combination of three basic parameters: cognitive skills and the ability to recognize the previously identified (cognition and recognition); the ability to respond to the identified; and understanding and knowledge of why this is so.

According to Jung (Jung, 1997), attitude was defined as a readiness of the psyche to act or react to stimuli in a certain way. In addition, Jung specifies that the presence of conscious and unconscious attitudes is very frequent and it is important to distinguish between them. According to the classical definition, attitudes include three basic components - cognitive (cognition, awareness), affective (emotional effect) and behavioral (behavior patterns). It is evident that awareness and attitudes are in some respects like joined vessels. However, they are not the same.

With regard to basic research objectives, five basic hypotheses were constructed for research purposes.

Hypothesis No. 1: The public is sufficiently aware of industrial hazards in its surroundings. The hypothesis would be confirmed if at least 50% of respondents answered that they were aware of the risk threatening them in the emergency planning zone and determined the specific type of risk. At the same time, they would have given at least partially correct description of the most important indications by which to find out an accident had occurred.

Hypothesis No. 2: The public knows adequate responses to actual types of industrial risks. The hypothesis would be confirmed if more than 50% of respondents stated they thought they knew how to respond in the event of an accident and at the same time more than 50% of those who gave such an answer described correctly how they should behave depending on the potential risk present in their emergency planning zone. The correctness of “adequate response knowledge” answers was planned for ad hoc evaluation from open answers.

Hypothesis No. 3: The information leaflet is a sufficient source of information for the public. The hypothesis would be confirmed if at the same time:

at least 50% of respondents stated they had seen the demonstrated leaflet; they obtained and wanted to obtain information contained in the leaflet; after being demonstrated the information leaflet for their emergency planning zone they were able to at least approximately reproduce its contents.

Hypothesis No. 4: The public is sufficiently aware of the possibilities of how it can influence the risk communication process. The hypothesis would be confirmed if at least 50% of respondents indicated at least two correct opportunities to participate in decision-making.

Hypothesis No. 5: The public perceives the responsibility for its own safety as the responsibility of the authorities rather than as its own. The hypothesis would be confirmed if the average score in questions assessed on a five-point Likert scale were higher in items for the responsibility of authorities (more often “Strongly agree” or “Mildly agree”) than in the item for their own responsibility.

Materials and methods

Based on the above mentioned hypotheses a questionnaire has been created. The research questions were defined quite broadly; therefore, it was necessary to choose a method that would guarantee a high return rate along with the widest possible coverage across the country. For the purpose of the research, a survey conducted by trained interviewers at preselected locations was selected. The focus of the research was both qualitative and quantitative.

The questionnaire contained a total of eighteen interrelated research questions allowing the evaluation of individual research hypotheses. The questionnaire contained multiple-choice questions, open questions and scaled questions. Four socio-demographic characteristics were taken into account for the purposes of the research: gender, education, occupation, and age; it was also examined whether the respondent (or his/her close relative) worked in the Seveso establishment.

The questions in the questionnaire were designed in such a manner that they followed each other logically while not being suggestive. In the first part of the questionnaire, questions were focused on finding information about potential hazards, knowledge of their effects and appropriate types of behavioral reactions. In the second part of the questionnaire, there were questions focused on the familiarity with information leaflets, preferred communication media and questions to assess confidence in authorities. When inquiring about knowledge of the information leaflet, an actual leaflet for the given

emergency planning zone was demonstrated. Socio-demographic characteristics were intentionally listed at the end of the questionnaire in order not to discourage respondents from responding.

The questionnaire was evaluated with standard statistical methods. In addition to testing of pre-defined hypotheses, significant correlations between the answers and other socio-demographic characteristics were sought.

To identify areas in which the survey should be carried out, all tier II Seveso establishments in all regions were identified and those whose emergency planning zone extended into populated areas were sought. Another criterion was that at least 400 residents should live in particular emergency planning zone. The minimum number of respondents for each Seveso establishment was 100. In most regions, only one establishment fit the conditions; in five regions none did. If more establishments in a region fit the conditions, then the largest one was chosen. In total, nine out of fourteen regions were examined.

The respondents were selected by quota sampling so that the sample would represent the Czech Republic population according to the data from the most recent census. The condition was that the respondent resided in the emergency planning zone and was at least 18 years of age. The survey was conducted from September to November 2013. Filling in the questionnaire took 5 to 10 minutes.

Results

At the end of the survey, the total number of respondents was 1067. The questionnaire was returned by approximately every fourth to fifth of those addressed. Beyond testing of research hypotheses, significant correlations were sought. In the correlation analysis, no significant relations were found that would go beyond well-known relations (for example, that younger people use the Internet more frequently).

Hypothesis No. 1: The public is sufficiently aware of industrial hazards in its surroundings. The first hypothesis examined the level of public awareness of industrial risks. The research results show that 48% of respondents stated that they thought they had knowledge of industrial risks in their surroundings. However, only 25% of respondents (see Fig. 1) were able to correctly answer the question of what type of risk they were threatened by. For each establishment in whose emergency planning zone the survey was conducted, the correct answers as to the types of risk (fire, explosion, toxic release, or a combination of fire and explosion) were identified beforehand.

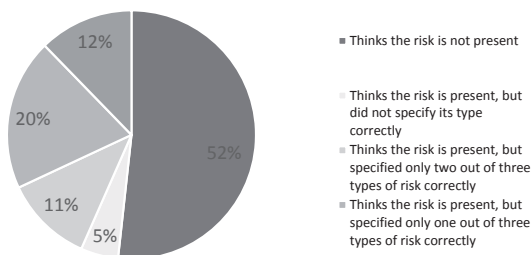


Fig. 1 Awareness of major accident risks (fire, explosion, and toxic release)

Another examined criterion was the knowledge of accident effects and of warning signals. The question was open and the correctness of answers was evaluated by clustering all answers into groups assessed as correct or incorrect. More than 58% respondents gave at least partially correct answer (at least a portion of their answer contained the correct means of warning). Very frequently, respondents indicated more than one option. Most often this involved a combination of accident effects (perceptions) and knowledge of acoustic signals of the national public warning and alerting system. More than 25% of replies referred only to recognition of accident effects (for example, “I will hear an explosion” or “I will start suffocating”). Such answers were assessed as incorrect because accidents are not always perceivable in this way (as is the case with toxic gas release which may not be detectable by olfaction) and because they conflict with the information provided in information leaflets. They specify clearly that the occurrence of an accident is announced by sirens.

The hypothesis No. 1 was disproved. The public is **not** sufficiently aware of the industrial risks in its surroundings.

Hypothesis No. 2: The public knows adequate responses to actual types of industrial risks. More than 67% of respondents answered a direct question stating they thought they knew how to behave in the event of an accident. However, only a portion of these respondents answered correctly on how to behave adequately in accidents that pose an actual threat to them (see Fig. 2). Questions about the correct response were categorized according to the types of potential accidents in the respective emergency planning zone.

From frequently mentioned incorrect answers it is evident that the adequate response is more envisioned as a generally applicable and intuitive reaction as “running away” or “finding a shelter”, rather than a forethought deliberate reaction to defined hazards. Although questionnaire may not be sufficient to capture actual and current knowledge,

from the manner of answers it can be inferred that residents in the emergency planning zones are lacking in a clear and unambiguous resource that would clearly describe the major chemical accident risk and the essential adequate response associated only with this type of risk.

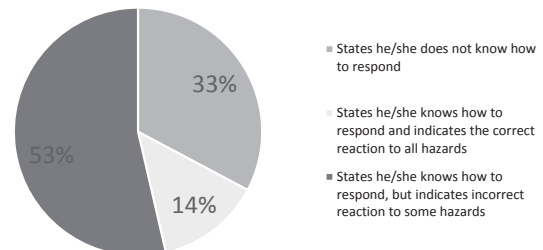


Fig. 2 Knowledge of the response to a major accident

When respondents were asked for specific procedures, their answers were often incorrect, misleading or insufficiently specific. Respondents often did not distinguish that the adequate response to a toxic release might be different from the adequate reaction to a fire or explosion.

The research also showed that the employees of establishments or their closed ones answered correctly more often the question of whether they thought they knew how to respond to an accident than people directly unrelated to the establishments. However, their answers, as well as the answers of other respondents, were highly variable, which is related to the variability of requirements on desirable behavior in various localities. Also, there is a low capability to distinguish between different sources of risk, both for risks associated with major-accident prevention and for other types of risks.

Answers to test the hypothesis No. 2 were evaluated ad hoc. Several categories to break the answers down were established and then divided into sub-categories. In the case of multiple answers, the best-scored answer was considered conclusive.

The evaluation of this research question was challenging because the documents of both the Fire Rescue Service and regional authorities specify reactions to major accidents quite unambiguously. However, some replies described responses that did not correspond to the recommended behavior, but under certain circumstances, they cannot be considered completely wrong. Evacuation or escape from the affected area can serve as an example. Although in emergency planning practically in all localities, finding a shelter is primary and evacuation is to be performed later, in varieties of situations immediate spontaneous evacuation might be a more appropriate solution. However, the correctness of

answers was evaluated primarily in the context of the recommended behavior as it is assumed that it is the risk communication process where the public should get recommendations on proper emergency response.

The research results showed that the public **does not know** adequate responses to actual types of industrial risks.

Hypothesis No. 3: The information leaflet is a sufficient source of information for the public. Only 4% of respondents gave an affirmative answer to a direct question of whether they used the leaflet as a source of information on chemical accidents. Then they were asked whether they had seen the information leaflet for the zone they are located in. At the same time they were shown the leaflet. Only 16% of respondents answered this question affirmatively. 78% of respondents stated they did not know or remember whether they had seen the leaflet. Only 6% of respondents claimed they had never seen the leaflet.

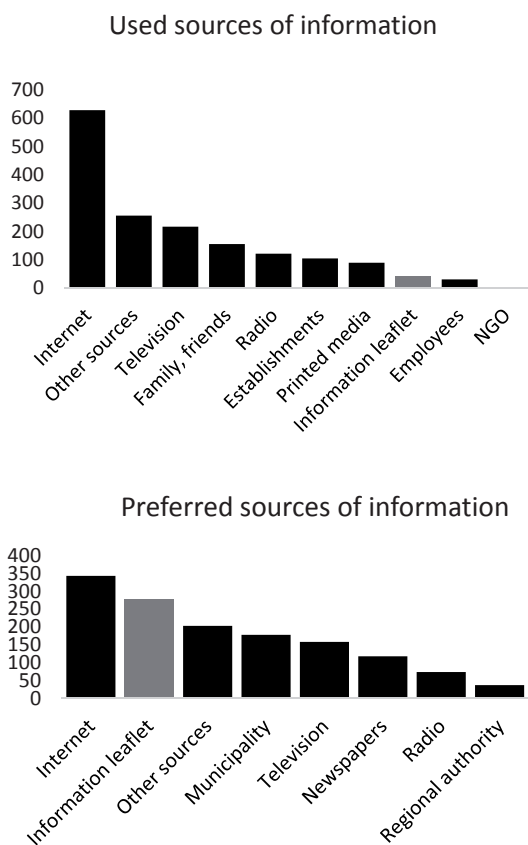


Fig. 3 Required and preferred sources of information (the total number of responses containing this option)

Only 16% of respondents stated they had seen the demonstrated leaflet before. Of these, only

30% knew for sure where they retained it. 87% of those who indicated to have seen the leaflet stated that they did not use it as a source of information. Respondents stating to have seen the leaflet statistically significantly more often claimed to know how to behave in case of an accident.

Subsequently, it was evaluated what communication resources were used most commonly by respondents and what communication resources they would have liked to use. Fig. 3 shows that the most frequently mentioned resources were the Internet - including social networks - TV, radio and other, which included emergency hotlines, emergency plans, the integrated rescue system, municipalities, city police, local authorities, employers and also non-specific information channels such as family, friends or neighbors. People with a university education statistically significantly more often stated that they used information leaflets as a source of information. Nevertheless, the information leaflet was one of the least mentioned sources of information.

Fig. 3 shows what sources of information would be welcome. The most frequent answers included the Internet and the information leaflet. A significant portion (35%) stated they were not interested in getting any information. At the same time, 65% of respondents would have welcome more information on industrial accidents. Namely, they would have welcome: List of possible risks involved; Description of actual risks, specification of the highest-risk areas and possible consequences of accidents; Determining Seveso establishments; exact description of how to behave in the event of an accident, including a list of necessary protective equipment.

Evidently, the information leaflet currently does not serve its purpose very well; even though, it was mentioned as the second most preferred source of information. Citizens want to use the leaflet and the information contained therein, but its present form makes it fail to meet the desired objectives. The graphs also show that the Internet is an important source of information and its integration into the public information system is an essential precondition for an effective communication.

The research results disproved the hypothesis No. 3. The information leaflet **is a not** sufficient source of information for the public.

Hypothesis No. 4: The public is sufficiently aware of the possibilities of how it can influence the risk communication process. The increased share of population involved in environmental decision-making and enhanced participation is required by Directive 2012/18/EU (EC, 2012), the Aarhus convention (EC, 2005). More than one

quarter of respondents (26%) expressed interest as to the awareness of the opportunities to participate in decision-making and of the opportunities to influence issues concerning chemical enterprises. Generally speaking, about a quarter of the respondents would like to take part in decision-making and approval of safety reports and emergency plans. Of these interested people, however, only 16% declared to know how they could participate in practice. It is therefore clear that a relatively large portion of the population in emergency planning zones is interested in participating in decision-making; however, practical information on possible involvement is not yet sufficient to make residents aware of the appropriate ways to get involved.

Due to the large number of wrong answers regarding the real opportunities to participate in decision-making, the hypothesis was refuted. The public **is not sufficiently aware** of the possibilities of how it can influence the risk communication process.

Hypothesis No. 5: The public perceives the responsibility for its own safety as the responsibility of the authorities rather than as its own. Trust and credibility are among the key parameters of effective risk communication (Allen Catellier, 2012; Burns, 2006). Respondents rated the level of trust and degree of responsibility they assign to various interested parties. The hypothesis was in large measure evaluated using a paired comparison of answers on a five-point Lickert scale. Fig. 4 shows that citizens ascribed relatively great share of responsibility to state authorities, but the level of trust in them was rather low. In addition, people trusted more local authorities (municipalities or municipalities with extended competence) than regional authorities which are currently in charge of chemical accident risk communication.

The establishments were the least trusted, which was primarily due to the fact that they were the source of risk, but other factors also may have played role (such as absence of communication or closed attitude). The most trusted were the bodies of the integrated rescue system - the Fire Rescue Service and police. These bodies were surprisingly rarely accounted responsible for the rescue in case of a chemical accident. This may be related to the overall positive view of the rescue services; the residents do not want to ascribe responsibility to someone whom they believe to rescue them.

The greatest responsibility was assigned to establishments, again as a source of risk. An interesting element in this context was the residents themselves. Although in the rescue system the residents are considered co-responsible for their

own rescue, the responsibility for their self-rescue was perceived by respondents as rather small. It was also evident that residents had more confidence in themselves than in state administration bodies (but less than in the integrated rescue system).

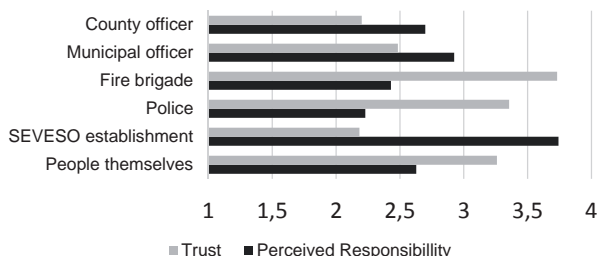


Fig. 4 Perceived responsibility and trust in institutions (average of responses on Lickert scale: 1 - agree, 5 - disagree)

The survey result has proved the hypothesis No. 5. The public **does** perceive the responsibility for its own safety as the responsibility of the authorities rather than its own obligation.

Conclusion

The goal of the survey was to assess the level of public awareness in emergency planning zones and to identify attitudes towards the current process of risk communication. The research has shown that people often think to know what risk they face and how to behave. However, a large portion of these people is biased. People also do not strictly distinguish industrial risks from other risks, but evaluate them conjointly. The answers also indicate that people do not distinguish between preventive communication and crisis communication (even though the interviewers pointed out the difference). It follows that the communication process newly proposed in the amendment to Act No. 59/2006 Coll. incorporating the requirements of Directive 2012/18/EC should reflect this and seek harmonization of major-accident prevention risk communication with other communication systems, whether they relate to nuclear facilities or to general population protection.

The survey results have also confirmed the importance of the Internet and social networks. It has been shown that the information leaflet currently does not serve its purpose. This does not mean that it should be abolished. It must be, however, used not separately, but linked and connected to electronic (and more up-to-date) version of the communicated information. The current method, and therefore the money spent, does not lead to desired preparedness and public awareness. The

process of risk communication cannot function only as a fulfillment of formal legal requirements. It is necessary to take into account that the population perceives and receives information differently than expected. For this reason, communication should be viewed more as a long-term process based on mutual trust and respect. It is necessary to include elements in the communication process that allow feedback, increase clarity and accessibility of information, use other tools and forms of communication, and motivate residents to behave responsibly.

The survey conclusions regarding trust and perception of responsibility have shown that institutions of public administration are not considered trustworthy as well as enterprises, which are regarded as the least trusted while held most accountable. If in the present system the communication is guaranteed by regional authorities that draw on information from SEVESO enterprises, then the perceived lack of credibility of the process may pose a barrier to effective risk communication. One of the solutions may be the involvement of other interested parties, including the Police and Fire Rescue Service that showed most credible.

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The current system of risk communication in the major-accident prevention does not function as well as it could and in many cases there is a potential for non-fulfillment of the requirements for informing the public to enable citizens to make informed decisions. This applies to environmental decision-making (the siting and expansion of chemical enterprises) as well as to adequate behavioral response in the event of industrial accidents. It is necessary to harmonize the current system with other areas of risk communication, allow the participation of other interested parties and benefit from additional communication channels, including their electronic version.

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