Managing a Potential Crisis: Evacuation in the Event of a Nuclear Disaster at the Krško Nuclear Power Plant

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A B S T R A C T

The article deals with theoretical cognitions and empirical findings regarding evacuation, especially human behaviour during it. The authors define evacuation and classify it, which is followed by a description of psychosocial theories dealing with evacuation, especially the »mass panic« view, the affiliation and normative approach and social identity approach. The article also presents the psychological characteristics of an evacuation. The second part of the article is based on the results of a public opinion survey and interviews conducted in October 2012 concerning the preparedness of the population, institutions and companies to evacuate in the event of a nuclear accident at the Krško Nuclear Power Plant (NPP) in Slovenia. The survey covered settlements located within a 3-kilometre radius around the NPP. The interviews were conducted with the managers of 12 major companies and institutions operating in the Municipality of Krško. The survey and interviews confirmed some basic theoretical assumptions about the attitudes and behaviour of people during an evacuation.

__Key words__: evacuation, nuclear accident, public opinion, human behaviour during an evacuation

Introduction

Evacuations are an important safeguard for mitigating the consequences of natural and man-made disasters. This is especially the case where an evacuation can be carried out in time before a disaster occurs, thereby protecting lives, reducing the number and severity of injuries and also protecting properties. In this sense, the evacuation of vulnerable populations is an effective way of reducing the negative consequences of disasters. Crisis management actors regard an evacuation as a generic protective mechanism because it can be an effective response to several types of disasters including floods, hurricanes, volcanic eruptions, accidents involving hazardous substances and also disasters at nuclear power plants[1].

Displacement of the population is necessary in order to prevent or mitigate a serious environmental threat where other approaches are limited in terms of their efficiency, safety, feasibility or excessive cost[2]. An evacuation can be considered as a complex psychosocial process which occurs as a result of warnings and/or actual necessity. It includes the withdrawal of persons from a threatened zone, their temporary sheltering and returning home[3]. Drabek[4] mentions different types of evacuation and provides the following classification that takes account of the stage of the announced evacuation and its duration:

– preventive (before an accident, short-term);
– protective (before an accident, long-term);
– rescue (after an accident, short-term); and
– recovery (after an accident, long-term).

Of course, other classifications are possible since in theory we recognise the existence of different terms such as mandatory, voluntary, recommended evacuation, declared or not declared (initiative, shadow) evacuation, formal and in formal evacuation, horizontal and vertical evacuation as well as general (mass) or partial, selective and gradual evacuation.

The main objective of an evacuation is therefore to protect human lives, but each evacuation (even one declared to be preventive, but where the anticipated inci-

dent did not occur) has a major impact on society and the economy. People are placed under significant stress, an evacuation can lead to a loss of income and decrease in production, while it can also have an impact on agriculture and the service sector. The costs of the operation itself and taking care of the evacuated people have to be added to this. As a result of these facts any decision to evacuate must be thoroughly weighed up[5].

With a preventive evacuation decision makers are put in a difficult position since they face a conflict of making a choice between the consequences of an evacuation if it is declared and the event did not actually occur, and with the consequences of an event (victims) if it in fact occurs but where an evacuation was not declared[6].

The importance of researching the evacuation phenomenon was also emphasised by Girod[6]. In the past, many events occurred where the evacuation was not timely and not effective, despite the existence of evacuation plans and even evacuation models. Girod believes that the problem partially lies in the fact that plans and models have not been sufficiently based on theoretical and scientific cognitions. In his opinion, the design and modelling of an evacuation should be based on sound socio-psychological theories and empirical findings concerning crowd behaviour in the case of an incident.

Materials: Conceptualizations of mass behaviour in emergencies

This section presents the most influential theories in the field of social psychology dealing with crowd behaviour in the case of an incident and crisis: the »mass panic« view, the affiliation and normative approach and the social identity approach.

According to the mass panic view, a collective response to a threat and disaster is often marked by hysteria and social collapse, accompanied by panic-stricken crowd behaviour[6]. The crowd response to a disaster is supposed to be irrational, inappropriate and excessive, which according to Girod is particularly rooted in performance sand films about disasters. This view provides an explanatory framework which builds on the assumption that a crowd is less intelligent and driven primarily by simple emotions. The crowd response to a crisis will be disproportionate compared to the risk and will spread rapidly among individuals. The instinct of the individuals hould prevail over socialisation and personal survival becomes the sole motivating factor. Socialites loosen, while instinctive, irrational and selfish (self-centred) behaviour prevails. People experience an intense fear directed toward something specific which can be labelled, and such behaviour can lead to a stampede, violence, the abandonment of family members etc. Panic can occur when the following conditions are fulfilled: a strong perception of physical threats (which are already present or appearing), the feeling of falling into a trap (limited opt-out), and the perception of collective powerlessness and isolation of the individual in moments of crisis.

This view has attracted serious criticism, with empirical studies also showing that in the event of a major crisis panic rarely occurs. The actual behaviour of a crowd in a crisis disproves the validity of panic view in at least three key respects: 1) anti-social and selfish behaviour is rare, even when the conditions for the occurrence of panic are fulfilled; if the panic is present it remains limited in space and time and does not spread to other people; 2) evacuations often continue in an orderly manner and people line themselves up (without any stampede), although they are in mortal danger; and 3) helping others and cooperation are common characteristics of a crisis. Such behaviour of people in crises is illustrated by the numerous cases that have been examined, even those that have caused extreme conditions. Some critics of the mass panic theory (for example, Sime, 1980) point out that authorities often blame the panic behaviour of people, and not their poor communication with the crowd. Appropriate communication can prevent fatalities, injuries and other consequences of an incident. In short, a crowd's behaviour in a crisis is not anti-social, but rational and socially structured.

The affiliation and normative approach claim[6] that people's typical response to the threat of a disaster is not to run away, but to look for the proximity of familiar people and places. Moreover, separation from the people to whom we are attached is a greater stress factor than mere physical danger. Examinations of mass evacuations show that families in a crisis do not break apart; just the opposite, people risk injuries and even lives to find their loved ones. Despite the risk, members of the same group wait for each other, help each other and withdraw together. In addition, the spatial dimension plays a very important role because people often withdraw from an area along the same path they used to enter (for example, an evacuation in the case of a fire in a building).

Again, this theoretical approach has also attracted some criticism because it fails to explain altruistic behaviour and assistance to others with whom we did not have any contact prior to an event. Even the prediction that the absence of familiar people and spaces can result in panic has not been verified since examples of panic behaviour in a crisis are relatively rare.

The social identity approach is based on the self-categorisation theory[6] which is a leading theory in the field of social psychology and has been successful in explaining different group behaviours such as nationalism, conformism, leadership, follower-ship etc. The basic premise of the theory of self-categorisation is that the social identity of an individual determines their social behaviour. Social identity is multi-layered because in addition to their personal identity people have many social identities, depending on their membership in organisations or groups.

Girod[6] summarises that the behaviour of people in mass crises is cognitive, which means it affects their knowledge about the nature of the crisis and its physical characteristics. Since the behaviour of a crowd is cognitive and holds special significance, communication with a

crowd is crucial because people tend to respond through participation and in an orderly manner, without becoming too emotional. Accordingly, the key element of crisis management is communication which also has the greatest impact on the course of an evacuation, and it is essential that people trust the source of information.

A comparison of the three theoretical approaches shows that the mass panic view emphasises the disintegration of social ties in a crisis, the affiliation and normative approach stresses their preservation, while the social identity approach draws attention to the creation of social ties in a crisis. Empirical data reveal that panic in crises is rare, crowd behaviour in a crisis is not anti-social and irrational, but structured, organised, confident and socially cohesive. People in a crisis will communicate, share information, seek closeness to relatives and friends, discuss various choices available and make decisions.

Girod[6] further observes additional phenomena accompanying an evacuation which, in his opinion, the theories do not consider in sufficient detail: the role of leaders (such as rescuers) from which people expect a lot and are inspired by them; gregarious behaviour when people respond in the same manner as others because they feel others have more knowledge and skills than they do themselves; underestimation of risks and warnings; the personal characteristics of an individual and his/her social role (father, mother, teacher…), and physical stamina.

Psychological characteristics of an evacuation

The question often arises as to why people sometimes respond immediately to warnings and sometimes not, and ignore all warnings about the seriousness of a danger. Answers to these questions have primarily been found in the research of Fischoff et al.[7] and Slovic[8]. Their research confirms that the fear of a danger is even greater when:

– exposure is involuntary (for example, a nuclear power plant close to a settlement);
– it is unequally distributed (some benefit from it, others are endangered by it);
– it is inevitable;
– it arises from an unknown or new source (a new, not yet sufficiently known technology);
– it is caused by man;
– its cause is hidden and causes irreversible damage (for example, a disease that can take hold several years after exposure);
– it is particularly hazardous to small children or pregnant women, or threatens future generations;
– the anticipated form of potential death causes horror;
– it may damage people who are familiar and not anonymous victims;
– it is poorly understood by science; and
– the responsible authorities offer contradictory claims.

Every debate on crises or disasters mentions uncertainty. The suddenness of an event and loss of control over it are its key features. It can be defined as the inability to determine the present or predict the future. It may occur either due to a lack of information, or because of its complexity or questionable quality. The need to reduce uncertainty is a key requirement of effective crisis communication.

Authorities responsible for crisis communication can often find themselves in situations where they have to interact with people, without themselves having clear and accurate information available. It is necessary to explain what happened as soon as possible, state the reasons, identify the possible threats, give clear instructions etc. The message must be clear and consistent, rapid and regular. This allows people to prepare themselves or take appropriate action. Uncertainty definitely increases if the main players do not agree on the nature of the crisis and the actions to be taken. What can appear is a communicational ambiguity, i.e. multiple (different) interpretations of a particular event. A crisis generates an abnormal context in which participants need critical information in order to reduce the uncertainty they encounter. Therefore, the search for information increases. If such information is not offered by the responsible authorities, participants will look for the information elsewhere. One outcome may be a growing amount of rumours and the resulting consequences.

In order to be effective, a warning should be comprehensible to humans. One requirement for this is that it has the same or a similar meaning for the intended audience. We need to ask ourselves what the participants need to know in order to diminish the risk, in order to minimise damage and maximise their own security and how they can ensure access to this information. In many cases, people are not even aware of the risks so it is especially important to be familiar with the population at risk.

It is well known and often seen in the media that almost every article about a disaster or threat mentions panic, in the sense that either the victims were supposed to have been in panic or that it may be necessary to prevent panic. Similar beliefs can also be found among those individuals responsible for rescues so they often deprive the public of the necessary information in order to reduce the appearance of panic. But is this truly necessary? Is panic really the worst thing that can happen to us? Research[9] suggests not. Fear is a normal response to a threatening situation and forces us to take actions aimed at saving our lives. Therefore, it is not reasonable to prevent fear with incomplete warnings. However, a fear that paralyses can be harmful. Although the unnecessary and excessive scaring of the vulnerable does not make any sense, the absence of fear is also harmful. Fear is therefore necessary, but it should not be either too strong or too weak. Sometimes, according to Sandman[10], we have to scare people in advance to prepare them for an upcoming threat. Reasonable fear is very effective in motivating behavioural change.

People's behaviour during an evacuation

It is often necessary to relocate masses of people before or during major disasters. Given that an evacuation can be a very difficult and complex process, since it is sometimes necessary to relocate thousands of people, it is also necessary to prepare for it. It is thus no wonder that an evacuation is an important element of many security plans. However, we must recognise the fact that during an evacuation we are not dealing with people who will be blindly obeying our instructions, who will merely be passive observers, but will actively participate in the events as individuals, groups or as a crowd. Knowledge of the factors that influence people's behaviour in the case of an evacuation can significantly facilitate the related tasks. Research shows[11] that, where possible, people prefer to stay at home rather than be evacuated. Even when they acknowledge a warning as valid and socially confirmed, they still might hesitate. This is not caused by any kind of numbness due to danger. We have already seen when under stress, in the face of imminent danger, people try to behave appropriately according to the requirements of the situation. Sometimes they can collectively decide to take some other action instead of evacuating. Such a decision can occur when there is only a moderate and not a strong conviction regarding the threat. At that time, people will seek to protect themselves by taking certain measures other than evacuation. Even when they feel particularly threatened, they will try to maintain a traditional and routine way of behaviour.

The effectiveness of an evacuation can be influenced by several different factors:

- socio-demographic factors such as the number of people, type and location of the population;
- weather and climatic conditions;
- the time of day;
- the geographical situation, for example, available routes and their capacities;
- the adequacy of transportation;
- people's responses to the instructions;
- the effectiveness of the communication; and
- the urgency of the action etc.

An individual's decision to relocate mainly depends on[12,4] the perception of the threat as real (the development of trust in the warning), the level of perceived personal risk (beliefs about the personal consequences of the anticipated event), and the presence of an adaptive plan, family, kinship and community. Let us consider this in more detail.

The perception of a threat as real

An adaptive response will occur if an individual believes a threat is real. Experience shows that the more a threat is perceived as real the greater is the likelihood of an evacuation. The perception of a threat is influenced by the content of the warning, past experience, the number of warnings received and source of the warning. The initial warning is usually accepted with disbelief, but even if the following warnings do not offer any new information the repetition of warnings increases the likelihood of an evacuation. Something similar applies to the credibility of the source providing the warning: the greater the trust, the greater the likelihood of an ordered evacuation.

Personal risk

People evaluate the potential impact of a foreshadowed disaster on themselves and their property. What is the probability that an event or its negative consequences will actually occur, how serious might the consequences be? When the perception of personal risk is high, it is more likely that an evacuation will occur. Although this may seem logical and obvious, people often underestimate the impact of disasters and believe they will not be affected; therefore they wait and do not respond to the warnings.

The perception of the risk is considered as a subjective assessment of risk[13]. It is an estimation of the extent to which a specific situation poses a risk, that creates a sense of security or a sense of fear. Authors distinguish three stages in the evacuation behaviour of an individual: before making a decision, the decision making itself, and action. In the phase before making a decision, the situation is not yet threatening and the individual does not feel fear, but might consider assessing the possible threat if a certain incident occurs. The decision-making phase relates to the decision-making process of an individual in a situation of a growing perception of risks due to an incident that has occurred. The action phase begins the moment an individual can no longer accept the currently perceived risks and starts taking protective measures (evacuation). The model developed by Mas, Imamura and Kishimura attempts to figure out for how long an individual needs to make a decision on evacuation.

Adaptive plan

In order for an evacuation to be successful, residents of a certain area must be informed in advance regarding the existence of an evacuation plan and its contents. They must be familiar with escape routes and destinations; otherwise, they will not evacuate or will evacuate themselves even into more dangerous areas. Research shows the existence of a positive correlation between knowledge of evacuation routes and reception centres (a minimum adaptive plan), and the likelihood that people will decide to evacuate. The individual's knowledge of the adaptive plan is primarily based on two factors: the content of the warnings and past experience. An effective warning is clear, specific, consistent and, where possible, provides guidance on appropriate personal protective behaviour. A warning represents one source of an adaptive plan, while another source is the experiences individuals take into account or are easily reproduced on the basis of past behaviours.

Family context

A family has an important role in the evacuation decision-making process. Research shows that in the case of

a conflict in roles and responsibilities individuals often give priority to the family, although they usually carry out their duties regarding the incident. Families affected by a disaster wish to protect their members. Research also reveals that families evacuate as a whole and stay together. When a family is not complete or the safety of the absent members is not guaranteed, it will not evacuate. In this context, it should be noted that elderly and sick people are reluctant to evacuate. Murray-Tuite, Schweizer and Liu[14] believe that the gathering of a family prior to an evacuation is very important. Lately there has been some research on this topic, and authors have been adding the question of gender into their analysis, in particular the question of the parents' response to an evacuation when their children are still at school. In interviews, mothers especially emphasise responsibility for their children and predict they would pick their own children up from school or kindergarten in the event of an evacuation. This surely affects the time needed for the evacuation of people who are collecting their family members.

Despite of general public beliefs about panic, even a serious threat warning would have difficulty provoking a panicky flight. It was repeatedly established that timely, valid and socially confirmed warnings do not cause the abandonment of traditional roles and responsibilities. A warning can even trigger a lot of self-control and group initiatives. Therefore, an important part of a crisis response is taking care that people are adequately informed. It is interesting to note that families (parents and children) respond very much like relatively isolated groups. They rely mostly on their own interpretation of warnings. Incomplete families and individuals chiefly rely on their earlier threat detection and contacts with important persons.

Where possible families will avoid public shelters and evacuate themselves to the homes of their relatives or friends if they are not too far away. Families can maintain their own supportive social system by engaging in a joint evacuation and taking up residence in the homes of friends or relatives. Wealthier families evacuate to hotels or their own secondary residences (such as a holiday home) outside the threatened zone. For them a public shelter can be stigmatising. Poorer families are more likely to use public shelters such as those organised by the Red Cross. Older people are also more likely to seek shelter with relatives. People retreat to their relatives' homes simply because they are invited, especially when warnings come on time. This all demonstrates that an evacuation is largely determined by normal everyday habits. Wherever they are families usually stay together and the behaviour of their members follows the same norms and values as before the incident, while their separation can have adverse consequences.

Kinship patterns

Wider family ties are important because a warning can be spread and confirmed through them. People tend to check the content of warnings with relatives or alert them to an emergency. Telephone conversations with rel-

atives have often played a crucial role in making the decision to evacuate.

Involvement in the community

The stronger the involvement of an individual in the community, the greater is the likelihood they will receive more information about the possible threat. In the USA, it has often been found that an evacuation is also influenced by race, social class affiliation and even ethnicity.

Sarangi and Krief[15] draw on two assumptions: 1) the decision to evacuate is similar to other important decisions in the life of a human: the cost (of the evacuation) occurs immediately, while the benefits (safety) occur in the future (for example, when the risk has dissipated); and 2) individuals do have their own beliefs about the necessary decisions, but are under the influence of others (social learning) who, according to the expectations of those involved in the event of an evacuation, play a key role.

Dash and Gladwin[16] note that, although the perception of risk is a key factor in the decision to evacuate, it is not the only one. Focussing solely on variables at the individual level does not capture the full complexity of the events. If we want to understand human behaviour, an evacuation should be considered as a process rather than an outcome. These authors believe that an evacuation is not a linear process, and note that hypothetical questions relating to evacuations (for example, in surveys) do not offer a good basis for realistically estimating evacuations. At least with respect to hurricanes, such estimates are much higher than actual evacuations. Here are some of their findings regarding evacuations in the event of a hurricane:

- people are more likely to evacuate if they hear a warning personally from another family member;
- families headed by elderly persons or which include such people are less likely to evacuate;
- families with children are more likely to be evacuated;
- people with higher incomes are more likely to evacuate;
- people living in small households are more mobile and more likely to evacuate;
- people who live in apartment blocks are more likely to evacuate than those in individual houses; and
- the ability of households to evacuate depends on their level of preparedness.

Method

In the second part of the article, the results of an opinion survey and interviews concerning the preparedness of the population, institutions and companies to evacuate in the event of a nuclear accident at the Krško Nuclear Power Plant (Krško NPP) are presented. Crucially important for understanding the data was knowledge of the broader context of empirical research. The survey in the field and interviews were conducted in Oc-

tober 2012, when memories were still strong of the nuclear accident at Fukushima in Japan due to an earthquake and tsunami in March 2011. The media was then still occasionally reporting on the consequences of the accident and we assumed that people living near a nuclear facility would pay special attention to such information. It is also noteworthy that in the Municipality of Krško and in its wider area activities related to the EU project *Preparedness for evacuation in the event of a nuclear accident* were taking place. These activities were being regularly followed by the local media. Finally, this survey took place at a time when stress tests of selected nuclear power plants in the European Union had been published, showing that the Krško NPP was among the safest nuclear power plants in Europe.

The research is based on a process of simple random sampling. This is a method where each subset of elements from the population has the same probability of being selected for the sample. The sampling frame included adult residents within a 3-kilometre radius around the NPP. Statistical characteristics of the realised sample match the characteristics of a simple random sample of N=1000 persons older than 18 years. A wider selection was carried out by the Statistical Office of the Republic of Slovenia and was entirely random. The response rate according to the sampling frame was 50.2 percent. The completion rate calculated on the basis of the ratio between the conducted surveys and the number of contacts amounted to 70 percent. In sum 502 people were interviewed. Statistical analyses of results obtained have been performed using the statistical tool SPSS.

As part of the study, interviews with leading personnel in 12 major institutions and companies in the Municipality of Krško were also conducted.

The basis for developing methodological instruments, both the questionnaire and a reminder for the interviews were theoretical cognitions and empirical findings about evacuations. The contents covered by both instruments are: the perception of threats and assessment of the probability of a nuclear disaster, knowledge of measures in the case of a nuclear disaster, the preparedness to evacuate, response to warning, behaviour during evacuation, transportation and temporary housing, and trust in institutions.

Results: Preparedness of population and institutions to evacuate in case of nuclear disaster

Threat perception of a nuclear disaster at the Krško NPP

The respondents were asked to evaluate how strongly they perceive the threat of earthquakes, floods, a nuclear emergency, drought and hail storms and strong winds. Each of the above potential threats was evaluated on a scale from 1 to 4 (1 – not at all threatening, 2 – low risk, 3 – medium risk and 4- high risk). An option to list (and evaluate according to the same scale) additional threats was also offered. This question places the perception of a threat from a nuclear disaster at the Krško NPP in the context of the perception of other threats. This permits a comparison of perceptions of threats.

The results show that, on average, the respondents perceive a storm with hail and strong winds as the greatest threat (the average response on the scale from 1 to 4 is 2.96), and a flood as the smallest threat (1.68). The threat of a nuclear disaster at the Krško NPP was attributed an average of 2.59, which is slightly more than for an earthquake (2.51) and slightly less than for a drought (2.79).

A nuclear disaster at the Krško NPP is perceived as a major threat by 28.9 percent of the respondents, 17.7 percent perceive it as a secondary threat, 28.9 percent as a small threat, and 19.3 percent as no threat at all. Further, 5.2 percent of the respondents did not know or did not want to specify how they perceive the threat of a nuclear disaster at the Krško NPP.

Crossings of the threat perception of a nuclear disaster at the Krško NPP with the demographic variables showed that the following categories of respondents feel more threatened:

- more women than men (for example, 31.2 percent of women and 26.6 percent of men feel very threatened);
- people in a relationship (married or cohabiting) rather than single people (31.5 percent vs. 23.7 percent);
- people who have a family member with disabilities, more than those who do not have them, and this is partly also true for those who have an elderly person at home; and
- any person with mobility impairments and physical disabilities more than those without such limitations.

Evaluating the probability of a serious nuclear accident at the Krško NPP

The respondents were asked to evaluate the likelihood of a nuclear disaster at the Krško NPP with serious consequences for the environment demanding the evacuation of the nearby population. The results show that most respondents (52.6 percent) believe that such a disaster is unlikely. In addition, 9.8 percent believe such a disaster is not at all possible. Conversely, some respondents believe that a disaster of this type is likely (24.5 percent) or even highly probable (6 percent).

Cross tabs of the likelihood of a nuclear disaster at the Krško NPP with demographic variables showed which categories of respondents consider that a serious disaster at the Krško NPP requiring an evacuation is more likely to occur: respondents with a lower education, respondents employed outside of their place of residence, respondents with lower incomes, respondents in a relationship (married or cohabiting), and respondents with physical disabilities.

Knowledge of measures

Regarding the respondents' knowledge of protective measures in the event of a nuclear disaster (sheltering, ingestion of potassium iodide tablets, evacuation, and temporary accommodation outside the threatened zone), the majority of respondents indicate they are partially familiar with the measures. Greater knowledge of sheltering and evacuation is reported, while the smallest amount of knowledge is about potassium iodide tablets. A relatively large proportion of individuals (15 to 30 percent) report not being familiar with the measures at all, while many individuals (16 to 22 percent) also report being familiar with them only partially. Probably the real proportion of individuals familiar with the protective measures is even smaller because people are often inclined to overestimate their knowledge, which was also confirmed by our research.

Most respondents do not discuss the protective measures and disaster management with their family members, only 2 percent of the respondents frequently do so. Individuals who report discussing the evacuation procedures with their family members often significantly better self-estimate their knowledge of temporary housing, while there is no difference between the groups in the self-perceived knowledge of potassium iodide tablets. Otherwise, the level of self-perceived knowledge concerning other protective measures is the lowest among the group in which they never discuss these topics with family members. This suggests that even an occasional discussion about this topic can have an important impact. It is thus worthwhile to promote discussion within families about preventive measures in the case of a nuclear disaster.

Preparedness to evacuate

In 2008 every household in the vicinity of the Krško NPP received a leaflet containing general information on how to react in the event of a nuclear disaster. The respondents were asked three questions regarding the leaflet. The first question was whether they still keep the leaflet at home, in response to which 36.3 percent of respondents said they still have the leaflet, whereas 45.6 percent stated they do not have it any more and 18.1 percent indicated they do not know whether they have it or not. This means that in the event of a nuclear disaster more than half of the respondents would not have knowledge of the basic key information that would be required for the optimal response.

In the event of a nuclear accident people can evacuate themselves in several ways. It is particularly relevant to know the share of those who will use their own means of transport. The results show that the majority of respondents would leave their homes using their own means of transport (79.8 percent). As an own means of transport, most frequently a car is meant (76.9 percent), as well as a motorcycle (0.2 percent) and tractor (0.8 percent). A minority would be evacuated by bus or train because of the proximity of the railway. Nearly 5 percent of the respondents would evacuate themselves on foot.

The respondents were also asked to name their place of reception and 55.4 percent stated that they do not know it. This means that in case of an evacuation they would be either waiting for such information from the authorities even though they already received this information in the leaflet in 2008 or moving elsewhere. Others (44.6 percent) selected one of the planned options we offered in the questionnaire. Those who stated they were familiar with the location of a place of reception were subjected to further analysis, with our intention being to check the correctness of their answers. It turned out that an additional 15.7 percent of respondents incorrectly stated the location of the place of reception. This means that a total of 71.1 percent of the respondents do not know the correct location. At the same time, more than half of the respondents are unfamiliar with the planned evacuation routes (51.2 percent). A further analysis was conducted to check the correctness of the answers of those who thought they knew the evacuation route. It emerged that 64.8 percent of the respondents indicated the correct direction of the evacuation routes, 26.4 percent reported the wrong direction, or their answers were too vague or unclear (8.6 percent). This means that about two-thirds of the population are not familiar with their evacuation routes.

Possible reactions to the announcement of an evacuation

Lessons learned from previous accidents at nuclear power plants and natural disasters show that the endangered population does not always behave in accordance with the official guidance. Sometimes they do not even take them into account, while at other times they act ahead of the guidance and evacuate themselves on their own initiative.

The image produced by our results is typical enough – the majority would take care of their family members first. This has to be taken into account in case an evacuation is declared. People will not evacuate themselves automatically on command, they will first take care of their family members and if possible – depending on the situation – they will also gather additional information. Only 10 percent would immediately evacuate themselves, while 2.4 percent would not evacuate at all. Obviously, an evacuation is a socially-based activity, and such an orientation may interfere with the planned actions and measures. This usually also depends on a person's profession, education and other demographic factors, but in this case gender, education and marital status did not affect the responses. Those with a primary and secondary school education would wait for their neighbours to evacuate together with them to a greater extent, and the married ones would be more likely to gather their family members first.

The time needed to prepare to evacuate after a warning has been received

After receiving a warning calling for evacuation residents need some time to prepare for their departure. The

length of this time is influenced by several factors: from verifying the warnings to gathering the family members. The respondents selected round time values ??(5, 10, 15, 20, 30, 60 minutes), which is a common response to such issues. People have a tendency to round up to so called prototype numbers.

Temporary housing

Regarding accommodation, 37.8 percent of the respondents would go to a reception centre and stay there according to the official instructions. An additional 23.7 percent would also go to an reception centre, but would leave it as soon as possible and go somewhere else. It is very important to bear in mind that the majority of respondents do not actually know the location of their reception centres. One-third of the respondents would evacuate themselves according to their own judgement, either to their friends or relatives (20.9 percent), to a holiday house or apartment (8 percent) or a hotel (5 percent). The share of people (4.2 percent) who would not evacuate is relatively high taking into account the level of danger. Most respondents expect to be offered measures related to their physical health and safety, and a relatively high proportion (32 percent) also expect psychological assistance. All of these measures are provided for in the official plans. The form of the expected measures and assistance does not vary between the male and female respondents. Younger respondents (those up to 30 years of age) to a smaller extent expect a variety of measures in the location of the temporary housing, which can also be explained by the fact that they also have a lower level of self-reported knowledge of the measures.

Trust in the relevant institutions

Trusting the responsible authorities is one of the main factors of complying with rules and appropriate risk management. Trust is difficult to obtain and can be easily lost.

It can be generally noted that the respondents expressed high trust to all emergency relevant institutions (management of NPP Krško, police, civil protection, regional notification centre, medical and fire services) with a little less trust in the mayor and much less in the government. All of the listed institutions would in one way or another be involved in any nuclear disaster at the Krško NPP so the levels of trust are extremely important. If the fire services, medical services, regional notification centre and the police have such trust, which is also due to everyday experiences, the mayor still has the potential to improve the level of trust although his score is still on the positive side. As far as the lower trust in government is concerned, it may be framed by its perceived effectiveness in dealing with the economic crisis. While gender did not influence the differences in the responses, more educated (secondary and higher education) respondents show greater trust in all of the institutions, except the mayor and the government.

An important part of trust is influenced by the respondents' opinions concerning the professionalism and preparedness of the competent institutions in the municipality to take action in the event of an accident. We have already established that families usually evacuate themselves together, which could seriously hinder evacuation efforts during that period of the day when schools and kindergartens are operating.

According to the respondents' answers, the perceived level of preparedness of the institutions is appropriate, which is an important aspect of trust, although there is some room for improvement. Trust in the management of schools and kindergartens is relatively high, but this does not mean that parents would not try to take care of their children on their own, regardless of the behaviour and preparedness of the institutions. The level of trust in schools and kindergartens is higher among female respondents. It will be interesting to consider the level of evacuation preparedness of educational institutions that can be established by interpreting the results of the interviews, which is what we turn to in the following paragraph, since this may be a good indicator of the justification of the trust shown by the respondents.

Preparedness for an evacuation by local institutions and companies

The majority of representatives of the institutions and companies with whom the interviews were conducted do consider the possibility of an evacuation due to a nuclear disaster at the Krško NPP. What is important is the finding that educational institutions (high school, elementary school, kindergarten) consider this possibility more than in privately owned companies. It is generally believed that the probability of an evacuation due to a nuclear accident is very low. In connection to an evacuation, the interviewees also consider the extent of any potential nuclear disaster and believe that in the case of a large-scale disaster at the Krško NPP an evacuation would not be possible (or necessary) because they are all located too close to the NPP. On a day-to-day basis the respondents do not burden themselves with their proximity to the NPP and express a high degree of trust in the individuals who are employed in the NPP and whom they know personally.

In most cases, specific plans dealing only with a nuclear disaster at the Krško NPP have not been developed. Some institutions have emergency response plans, but do not have specific plans or documents related to a nuclear disaster. Consequently, special preparations and exercises for actions in such event are not organised.

The respondents believe their own institutions/companies are generally well prepared for an evacuation when considering an evacuation for which they are responsible (for example, evacuating children from school buildings and kindergartens). The only exception is the nursing home for elderly people where the nature of its clients poses a significant obstacle to any quick and efficient evacuation. The most critical point of evacuation as assessed by our interviewees is the phase of an evacuation whose implementation requires the involvement of a large number of actors (for example, the organised trans-

port of children from schools and kindergartens). Respondents from educational institutions were not informed and are unaware of the existence of any arrangements between the municipality and transportation companies in order to provide a sufficient number of buses for all children from kindergartens and schools. Another important problem was identified, namely, parents' reactions since it is impossible to predict whether they will be coming to schools/kindergartens to pick their children up, even though that the municipality's emergency plan does not anticipate such behaviour. Cognitions on the behaviour of families during an evacuation confirm that many parents would certainly come to collect their children, which was also confirmed by the results of our survey as we could see.

Our respondents and their companies/institutions were generally not included in exercises relating to a potential nuclear disaster at the Krško NPP, except for the health service and pharmacy which participated in a national exercise in 2008; the pharmacy was not included as part of implementation of an evacuation, but with regard to stocking and supplying iodine prophylaxis. Regular evacuation drills are carried out in all of the educational institutions, but what they are practising is the evacuation of buildings, not evacuation along the routes provided for in the event of a nuclear disaster at the Krško NPP.

The educational institutions and companies selected for the sample do not possess any special protective equipment in the case of a nuclear disaster nor do they have any special protective equipment for employees who, due to the nature of their work, would have to stay at the workplace after an evacuation has been announced. The only exception is the pharmacy which is equipped with a sufficient number of protective masks for its employees.

When asked about the most critical point of an evacuation, the vast majority of interviewees evaluated the organised transport of children/elderly people and traffic conditions along the evacuation routes. The respondents expressed a particular concern with the feasibility of evacuating so many people with their own vehicles given that during any typical day the city is already congested with traffic.

Discussion and conclusion

Based on the review of the basic theoretical assumptions in the field of evacuations, the behaviour of people in a crisis, and the opinion survey it is possible to conclude with some key findings.

First of all, we may state that communication with people in a potentially affected area regarding the possibility of a nuclear disaster and evacuation is crucially important and must be addressed as a priority: a population will evacuate more efficiently if provided with the necessary information and if we do not treat them as being inclined to panicky behaviour. The withholding of information is inefficient in terms of a potential disaster, and

could also contribute to a general lack of trust in the responsible institutions.

Research shows that people in a threatened zone are poorly familiar with the evacuation routes and locations of reception centres so it is necessary to improve their knowledge. An opportunity to raise awareness (especially among young people who reveal lower levels of knowledge of the measures in the event of a nuclear accident) can also be found in the use of modern communication approaches since three-quarters of households in the area have Internet access.

The interviews showed the evacuation of children from primary and secondary schools and kindergartens is the most critical point of an anticipated evacuation as a whole, so it is extremely important to ensure an adequate number of vehicles to complete an evacuation. It is only by doing so that we can convince parents that in the event of a nuclear accident their children would be taken care of and there would be no need for them to pick them up themselves. During an evacuation it is also important to consider special categories of the population who are socio-economically vulnerable (the poor, the elderly, people without adequate social support) or who may have health problems.

Our research has also revealed shortcomings in the organization of temporary housing and return of people home after evacuation has ended. We assume that some people would find it easier to decide to evacuate if they were assured they would be properly taken care of in temporary housing and there are detailed plans for their return, with all the necessary restorative measures. At the same time, it is clear that some of the scenarios of a nuclear disaster do not predict and require the planning of the permanent resettlement of the affected population.

What raises strong concern is the fatalistic view held by some responsible authorities that in the event of a serious nuclear disaster there is nothing that can be done, an evacuation would not be possible or necessary, the consequences would be too serious, and people live too close to the Krško NPP in order to be evacuated in time. This approach reduces the responsibility of preparing for an evacuation and increases the risk of serious consequences even in the face of smaller and manageable disasters.

It is essential that when a nuclear disaster occurs the decision on evacuation is not delayed. People in the threatened zone must be told the truth about the accident as soon as possible, especially who is potentially affected and how to act accordingly. Otherwise, a pronounced media and social construction of reality based on rumours and improperly understood and interpreted facts may emerge. When designing a disaster warning it must be written or communicated in simple, understandable and clear language. It should be unambiguous, consistent, objective, fair and designed with a sense of empathy and understanding of people. In the future, it would also make sense to consider the use of modern information and communication tools for alerting the population

(SMS via mobile phone, e-mail) because the use of such electronic signals allows the transmission of messages and an assessment of their impact concurrently. Warnings must be repeated several times, even with the same contents since this increases the likelihood of an evacuation.

It's important that an evacuation does not underestimate the number of evacuees, their impatience, possible adverse weather conditions, traffic conditions, communication systems etc. What has to be considered is the possibility that in the event of an accident and the announcement of an evacuation not everyone would passively follow the instructions, but would be actively involved in the process of defining the situation and choosing the appropriate action and measures.

Despite some critical points revealed by the analysis concerning the preparedness for an evacuation in the event of an accident at the Krško NPP, an important positive note can be deduced from it in the conclusion: people's trust in the responsible institutions. It is thus necessary to continue to ensure relatively high levels of trust in the professional and political institutions and in the relevance of their engagement in a potential nuclear disaster, and that could be the basis for better preparedness in the future.

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UPRAVLJANJE POTENCIJALNOM KRIZOM: EVAKUACIJA U SLUČAJU NUKLEARNE NESREĆE U NE KRŠKO

SAŽETAK

Članak se bavi teorijskim spoznajama i empirijskim nalazima evakuacije, a osobito ljudskog ponašanja tijekom evakuacije. Autori su definirali i klasificirali evakuaciju, te opisali psihosocijalne teorije koje se bave evakuacijom, a posebice »masovnom panikom«. U članku se također predstavljaju psihološke karakteristike evakuacije. Drugi dio članka temelji se na rezultatima istraživanja javnog mnijenja i razgovora koji su vođeni u listopadu 2012. godine glede spremnosti stanovništva, institucija i tvrtki za evakuaciju u slučaju nuklearne nesreće u NE Krško (NPP) u Sloveniji. Istraživanjem su obuhvaćena naselja koja se nalaze u radijusu unutar 3 kilometra oko nuklearke. Intervjui su provedeni s menadžerima 12 velikih tvrtki i institucija koje djeluju na području Općine Krško. Istraživanje i intervjui potvrdili su neke osnovne teorijske pretpostavke o stavovima i ponašanju ljudi tijekom evakuacije.