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Evaluation of risk acceptability of serious accidents within the context of commonly occurring risks

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Hodnocení rizika přijatelnosti závažných havárií v kontextu běžně se vyskytujících rizik

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SEVESO rizika přijatelnost

Abstract

The goal of this project, using a survey questionnaire, was to determine the comparison of acceptability related to commonly occurring risks to which people voluntarily subject themselves; and, which of those risks are considered acceptable (mainly the first and the third question). It further deals with acceptability of risks posed by professional activities (specifically the second question); or, with less frequent risk occurrences which are posed by the hazards of Nature (the fourth question). The conclusion stemming from the results is that, in public's view, professional risks require roughly twice the level of reduction as opposed to the risks not related to the workplace.

Key words: Attitudes towards risks; acceptability of risks; evaluation of risks; SEVESO; prevention of serious accidents; social risks and, individual risks.

Abstrakt

Cílem bylo pomocí dotazníkového šetření porovnat přijatelnost spojenou s běžně se vyskytujícími riziky, kterým se lidé dobrovolně podrobují (především první a třetí dotaz) s přijatelností rizik, které jsou spojeny s profesním působením (především druhý dotaz) anebo s méně frekventovanými přírodními riziky (čtvrtý dotaz). Z výsledků plyne, že s profesními riziky je spojen zhruba dvojnásobný požadavek na jejich snížení oproti rizikům, která nejsou spojena s pracovním prostředím.

Klíčová slova: Postoj k riziku, přijatelnost rizika, hodnocení rizika, SEVESO, prevence závažných havárií, společenské riziko, individuální riziko

1. Foreword

A number of approaches around Europe are utilized during the decision making process pertaining to acceptability of dangerous operations; which, for example, may be presented by facilities under the auspices of SEVESO III and its directives (so called SEVESO companies). However, the work always proceeds according to the scenarios specific to their probability of inception and their level of impact; even, when the consequences involve fatalities; despite the fact that in those cases, it might be more appropriate to work with the number of injuries instead (Duim, 2009); or, economic consequences (Beckwith, 1996) and other aspects should be considered.

Individual approaches most often utilize scenarios from the point of view of their probability of inception or their size and level of their impact; or, also, they may utilize both approaches (Ganz, 2014; Kotek and Babinec, 2014). The reported approaches attempt to evaluate specifically indentified scenarios; and then, on the basis of established criteria, decide the level of their acceptability. Likewise, within the European framework, the process of tolerance determination is diverse. Acceptability may be assessed from social or individual points of view; it may, perhaps, follow combinations as, for instance, in Holland or in Britain (Ganz, 2014).The various tolerances of risk values are drawn from diverse works and methodology. Studies (Ganz, 2014; Jongejan, 2008; Beckwith, 1996) may be taken as examples; which, however, deal primarily with problematic of serious incidents. Different countries use the range of acceptability level (individual/social) within the rules of 10^{-3} to 10^{-5}. The question is, however, which standard is ever used to arrive at these values? Some studies claim, for example, that 10^{-4} value equals the innate death rate in children 10 to 14 years of age (Ganz, 2014).

Generally, however, it is possible to state that, decisions made regarding risk acceptability as pertaining to SEVESO companies, are mainly political decisions (Ganz, 2014; Hartford, 2009; Jongejan, 2008; Beckwith, 1996). In theoretical deliberations, however, it may be prudent to be deciding the risk acceptance on the basis of general understandings of risks (Beckwith, 1996). Ideally, when regarding risks, it would be more suitable to decide fully independently; that is, individually for each source of risk. Exactly, as it has been partially applied in Great Britain, for instance; where risk acceptability assessment rests on the shoulders of the local authorities, which corresponds with general recommendations. For example, Beckwith (1996) claims that, when judging influences on living environment, the probability of highly dangerous harmful impacts should be qualified within the highest possible measure. However, the value judgments regarding risk acceptability should be left up to the legal decision making authorities who are in close contact with a number of public opinion organizations. Commonly, the work should proceed under consideration that, whenever it is a case of acceptability decision, it needs to be stressed that risk also carries a certain social benefit [for example in the form of jobs]. With the same token, the decision process itself should be made by the local self-government – the political representation which, ideally, “should reflect” opinions of the locals who themselves are the most affected by the given source of the risk. The benefits denote the acceptability of risks (Beckwith, 1996). People generally tolerate implications of natural hazards and view such acceptance more favorably - when compared to risks created by human activity (Bell et al., 1990).

When it comes to decisions made at the level of individual people, in contrast to the judgment by legal authorities, it is clear that the key prerequisite is, for one, a certain personality trait structure; and, further, personal experience and the influence of the social environment (Mozga, 2009). The above mentioned determines the threshold measure at which the concerned individuals evaluate the given risk as acceptable. In that respect, the public media influence is also important as it markedly shares in individual and group attitudes and decision making processes. That fact should be reflected in areas in which the authorities put forward their decisions.

An extensive field research had been carried out within the framework of the research project Number TB030MZP006

titled “Research of Approaches to Evaluation of Social Risks in the Realm of Prevention of Serious Accidents”. The goal of the field research had been the mapping of the selected opinions and attitudes of the citizens of the Czech Republic regarding tolerance of social risks.

The target was to compare acceptability related to commonly occurring risks, which the public voluntarily subjects itself to; with acceptability of these risks interconnected with professional activities or with less frequent naturally occurring risks.

2. Methodology

A questionnaire survey had been utilized to collect the data. Then, the obtained data had been analyzed using standard statistical methods.

2.1 The Structure of questions posed by the questionnaire

The questionnaire consisted of two sections. The first section contained questions (questions 1 to 4) pertaining to acceptability of risks. The second part (5 to 10) listed questions pertaining to each respondent personally (demographical and sociological data).

The first section posed the following questions:

- *“Every year, approximately 30 500 people of the total inhabitants in the Czech Republic (approximately 10.3 million) are injured in traffic accidents. The odds that you specifically might be one of the victims, in a very simplified probability correspond to 1:300 ($3,3*10^{-3}$). Mark one of the listed choices which would be acceptable to you”. (traffic accidents);*
- *“Every year, of the total of inhabitants in the Czech Republic (approximately 10.3 million) 97 000 people (0.9 %) are injured during their work performance – work related injuries. The odds that you specifically might be one of the victims, in a very simplified probability, correspond to approximately 1 : 90 ($1,1*10^{-2}$). Mark one of the listed choices which would be acceptable to you“. (job related injuries);*
- *“Every year, of the total of the inhabitants of the Czech Republic, (approximately 10.3 million) 118 000 people (1.2 %) are injured outside of their respective places of work. The odds, that you specifically might be one of the victims, in a very simplified probability correspond to approximately 1:100 ($1*10^{-2}$). Mark one of the listed choices which would be acceptable to you “.(common injuries connected with everyday risks);*
- *“Total of 50 people (0,0005 % of the inhabitants of the Czech Republic) died in this country due to the most destructive natural catastrophe in 1997 (river floods). In a very simplified probability, the odds that you specifically might be one of the victims correspond to approximately 1: 200 000 ($5.0*10^{-6}$). Mark one of the listed choices which would be acceptable to you “.(injuries suffered during natural and other catastrophes that are connected to rarely occurring risks).*

The main task of the values utilized within the structure of the questionnaire survey was to illustrate the commonly occurring risks. The values applied had been drawn from generally accessible sources; such as, for example, the Czech Statistical Office (Český statistický úřad, 2015); their yearly report on the level of safety and of the protection of health in working environment (Mrkvička, 2014); traffic accidents – the Ministry of Transport (Ředitelství Služby dopravní policie Policejního presidia ČR, 2016). The listed values represent the natural level of risk against which no serious public backlash has arisen.

The main finding sought to be gained by questions posed was the public's attitude regarding natural measure of risk. By "natural risk" is meant the currently standing level. Meaning, the level corresponding to today's standards. Four areas had been dealt with:

- Traffic accidents;
- Workplace injuries;
- Common injuries caused by generally occurring risks;
- Injuries which occur due to natural and other catastrophes; a seldom appearing risk.

The question was, whether the existing measure of risk had been seen as an acceptable level, or, should there be a need to lower it (10x or 100x), or, is it still admissible to raise the level (10x or 100x).

For completion, there was also a need to determine where the respondents to the survey work; or the distance at which they live away from their production company or other facilities posing a potential for accidents. Listed as examples were chemical plants, warehouses containing chemicals; also waste incinerators and so on.

2.2 Selection of survey responders

At first, the potential respondents were contacted by electronic letters with a request to participate in the questionnaire survey. At the same time, they were notified regarding the commencement and the closing term for submitting of the online questionnaires. In mid May 2015 the respondents were sent e-mails with a request to participate in the questionnaire survey by VÚBP. Along with a web link to proposed questions they received short instructions for the questionnaire completion. The survey took place in the period between July and August 2015. 265 respondents submitted the completed questionnaire for a 50% return result.

3. Data analysis

A specific criteria list used in the electronic form to question the respondents had been created specifically for this particular evaluation purposes. The collection and processing of the received data had been done utilizing Google Apps and Microsoft Excel tools.

The data had been sorted out by the work team during the first part of the analysis; and the basic comments stemming from the resulting statistical information were processed. During the next phase, the connectivity between questions and the responses regarding the perception of risks was searched for. Categorization of specific answers to the given questions and interpretation of collected data was carried out at the same time.

3.1 Data

3.1.1 General description of the sample respondents

In total, 265 respondents took part in the survey. Within the assembled sample were 61% of men and 39% of women.

The highest age group represented was in the range of 31 to 40 years of age (32%); it was followed by range of 20 to 30 year olds (22%); and then, 51 to 60 range of age closed off at (14%).

As for the professional rate, technicians represented the highest number of respondents (33%); followed by office workers (20%); and the last were the specialists [19%].

Most often, the respondents originated from large cities with above 400 000 inhabitants (28); followed by those from small towns of roughly 1 000 to 5 000 inhabitants (14%); and the last group were from towns counting about 200 000 to 400 000 inhabitants (11 %).

Regarding education; university graduates holding master's degrees represented the highest number at (50%), followed by college graduates (17%), then university graduates holding bachelor degrees at (9%). The remaining (24%) of respondents did not report their education.

From the total number of respondents 29% resided within 1 to 5 kilometers from the manufacturing company or other industrial compound representing potential to cause an emergency situation, (for example, chemical companies, warehouses storing chemical materials, waste incinerators, etc); 22% of respondents' residences were within 5 – 10 kilometer range; and 17% of respondents lived within 10 – 20 kilometers away from the given object. The rest of the respondents resided mostly at a further distance from such objects; and in some cases, they were not aware of any location of a hazardous object.

3.1.2 Attitude of respondents toward the level of acceptable risk

Traffic Accidents

Regarding traffic accidents, the respondents were initially made aware of the reality that from a total count of residents of the Czech Republic (approximately 10.3 million) 30 500 people (0.3% of the residents) are injured every year as a result of traffic accidents. It had been stated that in a very simplified presumption, the chances were approximately 1: 300 that an accident may happen to some of to them closely related person.

This particular question elicited the answer from 245 respondents.

In the opinion of 123 respondents, the above listed number should be reduced by 10 times. Therefore, the listed value had been considered unacceptable by these people.

In the opinion of 70 respondents, the above listed ratio was an innate number of injuries. Therefore, the listed value was by them considered an acceptable measure of risk.

Next, 46 respondents held a view that it was necessary to reduce the number of injuries 100 times (that would mean by 305 injured individuals).

From values collected had been concluded that, the respondents required an average of 23 multiple improvement. That translated into 30 500 / 23, which is approximately 1 300 individuals (approximately 0, 01 % residents of Czech Republic). That equals a probability of 3, $3*10^{-3}/23 = 1{,}43*10^{-4}$.

Work related accidents

In regard to work related accidents, the first information submitted to the respondents was that, from a total number of inhabitants of the Czech Republic, approximately 97 000 people a year (0.9% of Czech Republic residents) are injured while carrying out work related to their occupation – meaning work accidents. The fact had been stated that this occurrence in a very simplified probability relates to a specific individual corresponds to approximately 1 : 90 ($1{,}1*10^{-2}$).

This question was answered by 176 respondents.

As for this question, 117 respondents would consider this number acceptable, provided the number of injuries is lowered by 10x factor (meaning, we are considering 9 700 individuals).

In view of 63 respondents regarding acceptance of this issue, it would be necessary to lower the injuries another 100x (meaning, we are considering 970 individuals).

Following the expression of 54 respondents regarding the acceptance of this particular number, it became clear, that the above listed values were a natural measure of injuries; and, therefore, are acceptable (meaning we are considering 97 000 individuals).

The conclusion from the collected data is that respondents require an average improvement of 41x factor. In this case, we could be considering 97 000 / 41, that is approximately 2 300 individuals (approximately 0,02 % of the residents of the Czech Republic). Therefore, the probability of $1,1*10^{-2}/41 = 2,68*10^{-4}$.

Common injuries in public life

In case of common injuries, the responders were initially informed that, from a total number of inhabitants of the Czech Republic, (approximately 10,3 million), roughly 118 000 individuals (1.2 % of residents of the Czech Republic) are yearly injured outside their job performance. The fact was stated that the question relates to a specific individual and, in a very simplified probability, the chances are approximately 1: 100 ($1*10^{-2}$).

This question was answered by 243 respondents.

From the view of 104 respondents emerges that, the above listed values were an inherent measure of injuries and, therefore, are acceptable. (Meaning that we are considering 118 000 individuals).

84 respondents believed that to consider acceptance of this number, it would be necessary to lower the number of injuries by another 10x factor (Meaning that we are considering 11 800 individuals).

A total of 44 respondents believed that to achieve acceptability regarding this issue, it would be necessary to lower the number of injuries by another 100x factor. (Meaning that we are considering 1 180 individuals).

From the collected values emerges a certainty that the respondents require an average of 21x improvement. Therefore, a potential consideration of 118 000 / 21; meaning, approximately 5 600 individuals (roughly 0,06 % residents of the Czech Republic); resulting in probability of $1*10^{-2}/21 = 4,76*10^{-4}$.

Natural and other disasters

Regarding cases of natural and other disasters, the respondents were informed that, during the most destructive occurrence of a natural catastrophe (example, floods) in the Czech Republic in the year 1997, a total of 50 individuals were killed; (0,0005 % of residents of the Czech Republic). The fact, that we could be considering a specific individual corresponds to a very simplified probability of approximately 1 : 200 000 ($5,0*10^{-6}$).

This question was answered by 243 respondents.

114 respondents believed that the above listed values are inherent measure of injuries, therefore, acceptable (that means, we are considering 50 individuals).

According to 69 responders, to achieve acceptability, it would be necessary to reduce the number of injuries by a 10x factor (meaning a consideration of 5 individuals).

Further, 41 respondents believed that discussing acceptability of this issue would be viable only under presumption of injury reduction by a factor of 100x (meaning a consideration of 1 individual).

From the collected values emerges a certainty that the respondents require an average of 23x improvement. Therefore, a potential consideration of 50 / 19, meaning, approximately 3 individuals (roughly 0,00003 % residents of the Czech Republic). Therefore, the probability of $5,00*10^{-6}/19 = 2,63*10^{-7}$.

4. Discussion

The four main questions inquired regarding the acceptability of monitored occurrences (injury as a consequence of a traffic accident; injury as a result of a job performance; injury outside of a job performance and, fatalities as a consequence of a natural disaster – a flood). Even though we know that individual models resolving acceptability of risks pertaining to SEVESO companies consider fatalities as a priority, the respondents were not asked about the acceptability of fatalities, except, in question #4. The reason was that, mentioning fatalities could influence the respondents' deliberation. In addition, the goal was to find the relation between acceptance of risks and their known measure - level.

The reason for selecting these four mentioned subjects was that relatively reliable data for them exist. Values applied in the questions drew from commonly available sources, as is, for example, the Czech Statistical Office [9], their annual report of safety and protection of health at work (Mrkvička, 2014); traffic accidents – the Ministry of Transportation (Ředitelství Služby dopravní policie Policejního presidia ČR, 2016). The attempt had been, also, not to work with the number of fatalities, in which case the exact mention of death numbers might evoke feelings in respondents that might possibly impair their judgment.

The following may be added to the individual findings. The first and the third question dealt with the area where the respondents undertake the risk, basically, voluntarily. The first question regarded acceptability of the number of injured as a result of traffic accidents; which, in the view of the largest part of the respondents are acceptable at the level of probability approximately 1: 3 000 ($3,3*10^{-3}$). In this case, the average value had been calculated at the $1,43*10^{-4}$ level. The required improvement was 23 times betterment. The third question dealt with the number of injuries away from workplace, which is in the view of the largest part of respondents acceptable at roughly 1 : 100 ($1*10^{-2}$) level of probability. The average value of acceptability for the third question was calculated at $4,76*10^{-4}$ level. The required improvement was 21 times betterment.

As for the second question, which dealt with the acceptability of the number of work related injuries, in view of the largest part of the respondents the risks were acceptable at approximately 1 : 90 ($1{,}1*10^{-2}$) level. The average value of acceptability was calculated at $2{,}20*10^{-4}$ level. The required improvement was 41times betterment. The reason for the approximate doubling of the required improvement, as compared to the first and third questions, is, most likely, due to the fact that within the working environment exist risks which the responders cannot influence much; and mainly, that they cannot decide on their own if to undertake such risks. The second question dealt specifically with workplace injuries, and, it may in respondents evoke a feelings of futility to influence something by their own will; therefore. they would require a lower measure of risk. That corresponds with the finding listed in Beckwith (1996).

The last question dealt with the acceptance of the number of fatalities during highly destructive catastrophes; which, in view of the largest part of respondents are the most acceptable at the 1 : 200 000 ($5{,}0*10^{-6}$) level. The average acceptability value had been calculated at $2{,}63*10^{-7}$ level. The required improvement average was 19 times betterment.

The most frequently selected answer regarding the acceptability of the current value, may, first of all, reflect that a smaller number of people were involved and, also the fact that specific natural disaster risks had been mentioned; which people may perceive as mighty and untameable. Obviously, the information of fatalities did not influence the deliberation of the respondents as in this case (the creators of the questionnaire avoided the fatality information in other parts of the questionnaire), because natural disaster risks are frequently taken more lightly than industrial risks (Beckwith, 1996).

From the collected data within the framework of this particular survey stems that, the lowest measures of acceptability regarding fatalities are the ones that tie in with extraordinary situations. This finding is affected by the value which creates the required level; which, in this case, is $5{,}0*10^{-6}$ while other cases carry values at the level of between $1*10^{-2}$ up to $1{,}1*10^{-2}$. The selection of criteria other than fatality could, however, open other approaches to evaluations (Jongejan, 2008).

Determination of acceptable risk values in connection with prevention of serious accidents has a long history. In most scientific expert documents the work is done only with specific values expressing acceptability. However, it is very difficult to find the source from which the used values originate.

The perception of acceptability of risk on the personal level in itself is given by certain personal traits; further, social influence plays a distinct role as well. As a result, an individual identifies with a certain group and, to a certain degree takes on group’s views as his own; as well as he accepts various approaches to situations; all resulting in overall behaviour. In the end, the foundation regarding approach to risk is given by the personality of the particular individual. In addition, since birth, the nurturing environment, represented by parents, friends, schoolmates, co-workers, various interest groups with whom the individual identifies, exerts strong influence on all people. At all levels, the society, the given rules, the culture, convictions, standards, and so on, are as well important factors (Ganz, 2014).

Regarding SEVESO companies, some values used to determine the acceptability of risks stem from several principal considerations. Dealing with, for example (Duim, 2009):

- Everyone is exposed to certain risk in daily life (background risk);
- Newly established SEVESO companies should not significantly affect the background risk;
- To operate a SEVESO company, certain technologies have to be searched out; such, that innately minimize possible development of a situation which might negatively influence the background risk (for example, change of technology, change of applied chemical agents (starters), use of the best available technologies – so called,

- BAT technology, etc);
- All activities aiming to support safety and reduction of risks should be applied in a manner that leads to the best result within the framework of SEVESO company as a whole.

As well, important part is played by the problematic of public's general awareness and knowledge.

The most widely utilized model in Europe is the Dutch model (respectively, it has, at least partially, influenced other approaches to evaluation of risks at SEVESO companies). This particular model is based on the premise that a risk posed by dangerous activity should not, in comparison, be significantly worse to the background risk. For that reason, an age group the least exposed to fatal risk had been searched out.

The group such identified was within the 10 - 14 years of age. On the basis of statistical data the frequency of fatalities had been defined at $1*10^{-4}$ per year (Zanting et al., 2003); which corresponds to the background risk. On the basis of our own research, the background risk may be marked as the risk of injury on the level of probability within $1*10^{-2}$ to $1,1*10^{-2}$ values. Had we worked with the risk regarding death, it might have been possible to consider the required background risk value at the level of $5*10^{-6}$.

From the value of $1*10^{-4}$ per year, which corresponds to one percent of the lowest everyday risk, a criterion of individual risk had been factored into the Dutch model; which corresponds to one percent of the lowest everyday risk. That, in the final result, corresponds to $1*10^{-6}$ per year (Zanting et al., 2003; European Industrial Gases Association, 2001; Bottelberghs, 2000). Regarding the needs for social risks assessment, the value for the individual risk had been transferred using the F-N curve in such a manner that the frequency value$1*10^{-5}$ per year corresponds with 10 or more fatalities. At the same time the specification for the slant of the straight line in the -2 value had been established in order to assure a reserved importance for more serious consequences. Therefore, to calculate "negligible" risks for social and for individual risks as well, a factor of 100 (Ganz, 2014) is applied.

On the contrary, for example, the Swiss system ignores the differences between probability and frequency; just the same, as it ignores the mutual influence of multiple scenarios (accumulation) (Jongejan, 2008).

Even though a procedure based on individual risk does exist, in view of rough planning, it is more suitable to work with social criteria (Jongejan, 2008). The value of the social criteria would be best to set, for example, through analysis of costs and gains (costs - benefits analyses), (Jongejan, 2008). However, this particular analysis is demanding. Aside of that, estimates and evaluations of impacts of extensive accidents on social life may be very complicated - almost unworkable.

While the individual risks are deliberated, it would be necessary, as an adjustment to fit the Czech society, to work with a reduction not 100x multiple, as cited in above reported case; but with a reduction hovering within a range of 19 to 41 multiples. The value of individual acceptability, therefore, should not range at the level aprox. $1*10^{-2}$ to $1,1*10^{-2}$ divided by 100, therefore should not be at the level of $1*10^{-4}$ to $1,1*10^{-4}$, but it should range within the level of $1*10^{-2}$ up to $1,1*10^{-2}$ divided by up to 41; meaning, at the level of $2,44*10^{-4}$ up to $2,68*10^{-4}$. And, adequately to that, the value of social risk should be corrected according to the procedure presented (Ganz, 2014).

The goal of the submitted work was to compare acceptability as it relates to commonly occurring risks which people subject themselves to voluntarily (as priority, the first and the third question); and, to compare the acceptability of risks connected to professional activity (mainly the second question); or, with the less frequent naturally occurring risks (the fourth question). The results show that professional risks present approximately double of the demand for their reduction as compared to risks not tied to working environment. In practical terms, the problem is, that, acceptability of risk should not be judged separately from economical, psychological, social, nor political impacts (Gow and Otway, 1990). Related to this is, that, it would be ideal if some of the particular values did not serve to restrict

certain areas in which some activities are banned, rather, to designate an area where the decisions should be more closely specified; as it is done, for example, in Great Britain.

The submitted work has tried to work with the fact that commonly occurring risks are perceived as standard background risks, which do not need to be adjusted. The existing level of risks, that people voluntarily undertake, and which are expressed in above documented values, may be taken as background risks. Similarly, Beckwith (1996) speaks about that. This has not been confirmed. It is clear from the collected data, however, that common risks may be taken as the ordinary background by the largest group of respondents (approximately 1/3). However, the respondents overall, even in this case, require approximately the same reduction of risk as in the case of traffic accidents; or, accidents away from work environment. This shows that the risk scenarios, respectively their probability of inception, should be considered as acceptable only at such attained level which has been reduced by the difference between the background risk and the attitude toward such risk; therefore reduced by the value of as much as 41 multiple.

Utilizing any specific values in true cases to establish the limit for the acceptability of risk is not quite correct. As Beckwith (1996) states - no correlation has been found between the measure of risks calculated, and the measure of those that have been actually monitored. At the same time, many factors are in play which impact on perception of risk. For example, the risk is acceptable more readily in cases of voluntarily undertaken risk. The perception of risk is also influenced by the level of knowledge (Huang et al., 2013). The less familiar risk, or risk which is unelected is less acceptable (Midden, 1993; Fischhoff et al., 1978), [18]. On the contrary, according to Wildavsky and Dake (1990), it is possible to “presuppose and explain” the type of personality which is able to identify the kinds of risk/danger and to judge its acceptability (Oltedal et al., 2004). It is also necessary to have considered the changing perception of risk acceptability, dynamics, when, at a given moment we may take certain risk as unacceptable; but, may become more acceptable within a different timeframe (Manuele, 2010).

It is difficult to determine which characteristics significantly influence perceived risk and the acceptability of risk only on the basis of risk profiles drawn from the average evaluation of variable risk characteristics (Beckwith, 1996).

As per Beckwith (1996), the decision regarding acceptability of risk is influenced by seriousness of the consequences, (for example, the number of people exposed to danger). Any evaluation of every risk is a very individual task.

During the data evaluation, it was ascertained, that in the case of question 2, an erroneous value related to the number of work-related injuries was used. The value of the number of people, who were exposed to a possible occupational injury, was correctly about half. This would also impact the declared value in this query. There would be no mention of 0,9% of the population in the Czech Republic, but correctly about 1,8% of the working population. Considering that respondents did not stop above this error (no response was recorded), it can be assumed, that the correct value would not influence them in their further decision-making.

It is also necessary to critically comment on the basic problems in working with the questionnaire.

The basic problem of the questionnaire used is that the respondent's personal interest in the risk, or the costs and benefits of the risk personally borne, is missing. The risk values presented in questions 1 to 4 are based on statistical values. The respondent can not influence them, he only makes his wishes, but without bearing the costs and benefits. This is the issue "what would you buy if you had money?". There is no personal interest in making money and spending it at a limited budget, when considering needs in relation to the size of the budget. This in turn leads respondents to the desire to reduce the 100x risk. If the respondents should respond objectively, then they have to respond to their specific actions, when they undertake the risk taking into account their benefits and costs. This, of course, can not be investigated differently, than the standard statistics from which the authors draw in the queries. At the moment, it is

acceptable to measure the risk, that the inhabitants of the Czech Republic report in statistics (statistical yearbooks). In real terms, when respondents should actually participate in a possible improvement, for example financially, it can be assumed, that the value of 100 times improvement is less frequently chosen.

In view of the findings, it should be noted that in the next investigation, it is necessary to better formulate question 2, where the erroneous value of the number of persons affected by the number of injured persons was used in the current investigation. The problem of the questionnaires used is also the lack of influence of the respondent's personal involvement.

5. Conclusion

When establishing the acceptability of a serious accident and its evaluation on the basis of SEVESO III directions, nowhere in all of Europe applies the same approach which would unify and unequivocally restrict disintegration of the problematic into individual local methods. Regarding acceptability, each country considers its own specific values (social/individual) and that leads to a situation in which the same SEVESO company follows different conditions in every country.

While assessing the acceptability of a serious accident in the context of commonly occurring risks, the task had been to find such value of risk which would reach the required (socially acceptable) level; perhaps, which could be sustainable at this level for the long term. The change in the perception of risk and its acceptability is practically always tied to the rise of costs. The comparison of acceptability of risk of serious accident with commonly occurring risks is, therefore, guided by the attempt to find a limit to which the bearable risk may be further lowered (the bottom threshold of acceptability) so that it is socially acceptable and the costs are economically viable.

We consider commonly occurring risks as the background risks; which the society as a whole does not attempt to significantly change. That, for the last two decades, is underlined by only little variances in the order of the first tens of percentage. From the collected data it is clear that the respondents still demand certain improvement. The respondents consider as acceptable only a specific level of the values pushed lower by 19 to 41 times in comparison to current levels. Acceptable should be occurrences which happen approximately in roughly only a half of the frequency as is the current assumed level of such occurrences. In case we started with similar values as, for example, Dutch approaches do, which start out from the number of child fatalities, we would not have to consider a 100 times lower suppression, but a 41 times reduction could be sufficient.

For example, regarding individual risk, based on the background fatality level frequency of $1*10^{-4}$, it would be possible to consider as acceptable the level not $1*10^{-6}$,but $2,44*10^{-6}$. Which would correspond to the value of social risk at a level of 10 or more fatalities at $2,44*10^{-5}$ (slant of the straight line at value -2).

Concerning professional risks, the results have also shown that roughly a double requirement is wanted for their reduction (41 times) as opposed to risks not directly connected to the workplace (21 times). All that should not be judged individually, disregarding economical, psychological and political consequences. Connected to this is, that these determined values should not serve only to denote an area in which something is banned, but to identify an area where better decisions should take place. Unfortunately, this type of individual evaluation is not possible in current common practices.

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