Safety research of population according to population differentiation in Czech Republic

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***Abstract*—** The aim of the project is to analyse the current status of the evacuation planning from the emergency zone planning according to the population differentiation and the population readiness for potential disruption of functionality of critical infrastructure, to suggest new methods of evacuation planning along with incorporating new aspects of health evacuation protection and design manuals for the population on the methods to handle emergencies with the disruption of critical infrastructure in the context of ethical issues. The evacuation is preferably planned for the following groups of population: children under 15, patients in health care facilities, persons placed in social institutions, persons with disabilities. Medical support during evacuation primarily involves ensuring the provision of pre-medical health care assistance, transportation to medical facilities and the provision of hygienic and epidemiological measures. The responsible entity is the municipality in cooperation with the Emergency Medical Service and a relevant public authority.

***Keywords*—** critical infrastructure; population differentiation; evacuation; information

I. Introduction

To reduce threats in the Czech Republic, the Home Office proclaimed the Security Research Programme in the Czech Republic in the years 2010 - 2015, where into the 3rd public tender in research, experimental development and innovation project of the University of South Bohemia in České Budějovice was accepted, titled "Population Protection According to Population Differentiation", which is designed for 2013 - 2015.

The aim of the project is:

1. analysis of the current status of evacuation planning from the emergency planning zones of nuclear power plants Temelín and Dukovany, according to the differentiation of the population, and to prepare people for possible disruption in critical infrastructure
2. proposing a new methodology for evacuation planning along with integrating new aspects of medical support
3. designing manuals for the population for the procedure to handle emergencies with the disruption of critical infrastructure in the context of ethical issues.

The main body of the evacuation planning is the Fire Rescue Service of the Czech Republic, in cooperation with other government bodies and local authorities. The evacuation of people is arranged in external emergency plans, emergency plans of the regions, in flood plans and in plans for major dike breaches with a subsequent special flood risk (protection plans for the areas under hydraulic structures against special flood).

Evacuation as a protective action has been studied for decades in the context of many environmental hazards. The process of evacuation is typically studied from a behavioural perspective that involves examining factors that influence public compliance with evacuation recommendations or from an engineering perspective that focuses on traffic flow modelling and estimating evacuation time. These two perspectives are not mutually exclusive, and recent efforts have shifted toward integrating these two perspectives. [1]

Evacuation is an integral part of protecting the population. It needs to be properly planned and executed with all aspects that may affect the progress of evacuation. One of the important aspects that influence the planning of evacuation is the differentiation of the population in the areas of emergency planning. Currently, there are strategies only for the categories of preschool children, school children and adults. The evacuation planning needs to take account of the senior category, the sick, the disabled and other categories. In the context of the preparing and executing evacuation, a number of ethical questions comes out. Discussion in international literature focuses on informing people with disabilities, their opportunities to participate in the decision-making, justice and non-discrimination, human dignity and the respect for individuality, and on special measures for different risk groups. Attention is paid not only to the legislative situation, but also to recommendations for the conduct of the parties, e.g. fire fighters, police, paramedics.

In the Czech Republic, the issue of critical infrastructure protection has been discussed in recent years. Disruption of

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critical infrastructure elements results in disruption of infrastructure itself and causes limited supply of services and goods to the population. In order to minimize the impact on the population, it is necessary to have an informed population. The population is still unaware of the necessary information and knowledge about self-protection. This comes out of the absence of awareness of the population in particular regions. The citizens of the Czech Republic rely on assistance from the state, which is not an ideal situation. It is necessary to engage the actual population in the preparation, similar to other countries in Europe and North America.

II. Procedure for Paper Submission

The main objective of the present project is to develop sophisticated procedures and evacuation planning methodology with regards to the evaluation of the current state of emergency and crisis planning. The first step will be the analysis of population differentiation in the emergency planning zones of the Temelín and Dukovany nuclear power plants, regarding various categories of the population (preschoolage, schoolage, adults and elderly population, health, physically and mentally handicapped) and the application of evacuation on the zone of emergency planning of JE Temelín.Following the differentiation of the population, an assessment of the readiness of people to deal with emergencies in connectionwith the failure of critical infrastructure (electricity) will follow. The topic is very current, because the risk of natural disasters, catastrophes due to a human mistake or technical failure can never be eliminated. Disasters affect people and cause loss of lifes. It is necessary to prepare operational manuals for the emergency management authorities for sophisticated planning of evacuation. An important part of dealing with emergencies and crisis situations is the readiness of the population, which should not only rely on assistance from the state, but to participate in dealing with these situations.

Planning of the evacuation measurements requires:

a) to determine evacuation areas and the order of evacuation, to define evacuation routes with sufficient capacity for vehicles, to determine the needs and to provide the means of transport, the operation of evacuation and reception centres, to determine the location of emergency shelters and to create conditions for accommodation of the evacuated population,
b) to ensure the throughput of the evacuation routes, to control population movements during evacuation and to close the evacuated space,
c) to identify, prepare and ensure the designation of places of assembly, to determine the process of evacuation of the danger area and to control abandoned homes, to ensure the security of the evacuated area,
d) to prepare the implementation of admission of the evacuees, to clarify the emergency accommodation needs, to prepare the groundwork for further distribution and transport of the evacuated population from centres of evacuation to centres of reception,
e) to prepare and manage traffic using transport timetables, based on an analysis of evacuation routes and the resulting capacity,
f) to prepare documentation for receiving evacuees at reception centers for redistribution of evacuees and their transport to the municipalities receiving evacuees,
g) to provide emergency accommodation and prepare documentation to receive evacuees in shelter locations,
h) to prepare evacuation procedures and the location of livestock, machinery, objects of cultural value, technical equipment and material necessary to preserve the production,
i) to prepare the process of informing people,
j) psychological preparation of the people before and during the evacuation and a long-term stay in a replacement facility,
k) to ensure documentation of taken decisions and measures implemented throughout the evacuation.

In the areas of emergency planning of nuclear installations (JE Dukovany, JE Temelín), the planned evacuation relates to the population of a part or the whole of the urban area, or a larger territorial area. It is based on the following principles:

a) in case of a fault in a nuclear power plant technological mechanism, which could result in a radiation accident, the preparation of direct evacuation is initiated. Direct evacuation means evacuation carried out without previous sheltering of the evacuees.
b) in the case of a radiation accident, depending on the wind direction, evacuation with sheltering is carried out from the center and from other selected sectors. Evacuation with sheltering means evacuation conducted prior sheltering the evacuees and after reduction of the initial risk of exposure to radioactive cloud.

2.1. Medical evacuation

Medical evacuation firstly includes security pre-medical health care assistance, transportation to medical facilities, and security hygienic-epidemiological measures. It is provided by the municipality in cooperation with the Emergency Medical Service and the relevant public authority. Evacuation centre provides, inter alia, first medical aid, or pre-hospital emergency care and transportation of the sick or injured to medical facilities.

2.2. Crisis preparedness in health sector

Emergency and crisis situations demand an effective interaction among multiple organizations with very different cultures, under the pressure of dealing with an event in evolution.[2] Crisis preparedness in health sector is the ability of health care providers - medical facilities - to ensure the provision of necessary medical care to the population of a locally relevant administrative unit for crisis situations and emergencies in accordance with medical principles for the provision of health care by professionally qualified personnel.

By the end of 2012, in the Czech Republic were kept records of 28,753 medical facilities (303 more than in 2011), of which 20 224 were independent outpatient clinics (an increase of 103 facilities compared to 2011).

If we divide the facilities by founder then:

- 213 facilities were state run - founded by the Ministry of Health (117 facilities) and other central institutions (96 facilities)
- 28,540 facilities were non-state (founded by a region - 149 facilities; founded by a municipality - 169; founded by a physical person, church or other legal entity - 28,222).

By the end of the year, in all these health facilities there were employed 46,968 doctors and 107,478 independent medical workers, non-doctors (always converted into full time employment). On average, there was 1 doctor for 224 inhabitants of the Czech Republic.

Necessary health care (for emergency situations) - The extent of health care that will ensure the population to survive the crisis without causing serious personal harm due to reduction in the standard extent of health care forced by the crisis situation, if such harm can be objectively prevented.

The plan of coverage of the South Bohemian Region with emergency medical service ambulance bases

The Region is obliged to provide continuous availability of emergency medical services is to the extent specified by the regional plan for ambulance bases coverage. The regional plan for ambulance bases coverage determines the number and location of ambulance bases depending on the demographic, topographic and risk parameters of the territory of each municipality, so that the scene of an emergency in the territory of each municipality is reachable from the closest ambulance base up to 20 minutes in driving time. In order to determine the number and location of ambulance bases, the provision of emergency medical services in the Region by emergency medical services established by other regions is also relevant.

The plan of regional emergency base coverage is issued by the Region; the plan must be updated by the Region at least once every 2 years. Data for the plan of emergency bases coverage in the region and its update are processed by the provider of emergency medical services.

In South Bohemian Region, emergency medical service is provided by one provider, a contributory organization established by the Region, the Emergency Medical Services of the South Bohemian Region (ZZS JČK). The Emergency Medical Services of South Bohemian Region has got one territorial and six regional centers - ÚS České Budějovice, OS Český Krumlov, OS Jindřichův Hradec, OS Písek, OS Prachatice, OS Strakonice, OS Tábor.

Each center is divided into 27 ambulance bases. The ambulance bases have at their daily disposal 48 ambulance teams, including 30 assistance ambulance crews (RZP), 12 medical ambulance crews (RLP), six Rendez-vous crews (RV) and one air ambulance crew (LZS). In the night, 40 ambulance teams stay on duty, including 23 assistance ambulance crews, 12 medical ambulances crews, and five Rendez-vous crews.

South Moravian Region - The network of institutional care comprises 21 hospitals, seven specialized treatment facilities including a spa, two hospice facilities and one other inpatient facility with specific specializations. The hospitals have a total of 7,297 beds and 95 places, of which 88% are acute beds (6,313 acute care beds and 142 neonatal beds) and 12% after-care beds (842 beds). There worked 2,744 doctors, converted into full time employment, and 7,851 paramedical personnel. Inpatient care in the region is complemented by spa care providing 312 beds. There worked 4.85 physicians and 18.78 paramedical workers. In outpatient care provided to patients in separate outpatient facilities and ambulatory parts of inpatient facilities, there operate 4,025 full-time equivalent physicians, representing nearly three-quarters of all physicians. Full-time equivalent number of paramedical personnel was 6,600, which means 51% of their total number. Special medical facilities, such as infant homes, orphanages, children's centers and clinics for children, adult care centers, nurseries, drip stations, transportation and emergency medical service is represented by 110 full-time doctors, 439 paramedical personnel positions and 679 places.

Vysočina Region - The network of institutional care consists of six hospitals with 2,649 beds, of which 92% are acute care beds and 8% after-care beds. Hospital care is supplemented with 11 specialized therapeutic institutes (OLÚ) with 1 987 beds - 69 beds% are distributed among four psychiatric hospitals. There is a total 701 doctors and 2,407 paramedical personnel working in the hospitals, and 125 doctors and 720 paramedical personnel in specialized therapeutic institutions. At the disposal of the hospitals in Vysočina Region is a total of 2,649 available beds and 433 physicians. The ambulatory sector in Vysočina Region has a total of 1,269 physicians and 1,987 beds available at specialized medical institutions. In outpatient care are involved 1,269 doctors and 2,329 paramedical personnel. More than a half of the doctors provide primary care - practitioners for adults, general practitioners for children and adolescents, female general practitioners and dentists. Other doctors work as outpatient specialists, 48% of them in private practice.

III. METHODOLOGY OF RESEARCH

To determine the underlying data to process a certified methodology that will serve as the basis for the adjustment of

legal measures related to the VHP nuclear facilities, there is a questionnaire survey.

To cover all spheres of life in the emergency planning zone (hereinafter "EPZ"), four types of questionnaires have been prepared for households, individually for physical persons, schools and educational facilities and social facilities.

3.1. Household questionnaires

Between November and December 2013, questionnaires were distributed to all local authorities in both EPZ‘s. The questionnaires are addressed to all households in both EPZ‘s. Distributed questionnaires are registered in the municipalities in the way that 13,750 questionnaires were distributed in the EPZ JETE and 54,490 questionnaires in the EPZ JEDU, making a total of 68,2402 questionnaires.

Prallelly with this leaf form an electronic version of the questionnaire was prepared with a direct possibility of completing it on-line on the faculty website. This is a questionnaire for households in the EPZ‘s. The census of the questionnaires cast has not yet been completed, but the EPZ of Temelín nuclear power plant returned 939 questionnaires and the EPZ of Dukovany nuclear power plant has returned 4,503 questionaires.

3.2. Questionnaires for physical persons

In the same period, April to November 2013, a questionnaire was prepared for physical persons. Because this survey aims to determine accurately the views and knowledge of the population by age groups, citizens were divided into 4 age groups.

To ensure the objectivity of the investigation and the statistical significance of the investigation, it was all based on the percentage representation of each of these groups of the population determined by the last census; in the same proportion the number of questionnaires was prepared for individual communities of both EPZ’s. The questionnaires were addressed to all municipalities of both EPZ’s and the survey was conducted by contact mode.

Every EPZ was addressed 500 questionnaires. Considering the mode of data assembling, 100% of questionnaires were returned.

3.3. Questionnaire for nurseries, primary and secondary schools and educational facilities

All nursery, primary and secondary schools and educational facilities were found in each EPZ. The questionnaire is focused on personal and material possibilities of each school. In the EPZ of Temelín nuclear plant there are 11 kindergartens, 12 primary and two secondary schools. There is also one educational facility. In the EPZ of Dukovany nuclear power plant there are about 70 kindergartens, 66 primary and 5 secondary schools and three educational facilities. In all schools, data for the questionnaires, a total of 16 questions, were obtained by contact mode with the exception of schools in the EPZ of Dukovany, where questionnaires were sent to each school with a covering letter asking for their completion.

3.4. Questionnaire for social facilities

The same procedure was followed with social facilities, data collection by contact mode in all facilities, which means that in the EPZ of Temelín nuclear power plant there are 2 social facilities and both questionnaires are available, and in the EPZ of Dukovany nuclear power plant there are 12 social facilities. Also, all completed questionnaires are available. The questionnaire contains 20 questions.

3.5. Questionnaire on the awareness of the population in cases of electric energy failure

To determine the underlying data to process manuals for the population, there is a questionnaire survey. The author - designed questionnaire reflects the structure of selected questions focused on basic problems that people may encounter during power outages and their own self - protection during this incident. The questionnaire was presented to respondents in the emergency planning zone of a nuclear power plant and to respondents living outside the emergency planning zone of a nuclear power plant. The comparison of the knowledge of these two groups will be taken using parametric selective t-test.[3; 4] The type of questions found in the questionnaire is based on various recommendations of international organizations and agencies, such as the CDC (Centres for Disease Control and Prevention in Atlanta), which deals with the readiness of the population issuing from biosafety during power outage (What You Need to Know When the Power Goes Out unexpectedly, 2009).[5] Federal organizations FEMA (Federal Emergency Management Agency) prepares the population in the form of analyses of previous power outage and creates a system for individual federal countries of the USA on how to prepare the population(Power Outage Checklist, 2012). [6] Ministry of Agriculture Department of food safety and inspection the information they publish on their website is valuable material for the population and a manual how to preserve quality food during emergencies. All information is given in the 12 factual points [7] or Canadian government authorities Canadian government has issued a publication entitled Your Emergency Preparedness Guide 72 Hours. [8] This 36-page publication provides instructions to the population on how to proceed in case of selected 13 critical situations. Among the selected situations is power outage. [9] , [10]

IV. Realisation of the Research Awareness Project

Within the statistical survey we examine two research variables – the knowledge about power failure of the population in the emergency planning zone of a nuclear facility and the knowledge of the population outside the emergency planning zone of a nuclear facility of the issues of power failure and type of theoretical distribution. Out of the possible types of theoretical probability distribution we used the Gaussian distribution of knowledge about electric power failure. For the variable "type of theoretical distribution" we chose its particular value for "normal distribution" for the frequent occurrence of normality at that type of investigation. The variable "knowledge" will be tested in terms of research assignment in two samples of respondents - in the zone and outside the zone.

Within the statistical survey, a total of 400 questionnaires were distributed within emergency planning zones and also 400 questionnaires outside emergency planning zones, which directed the questions to determination of public awareness about electricity outages. Questions were divided into two groups. One group of questions was strictly informative (where people live, whether they own alternative sources of electrical energy, and what the influence or power outage is medically). The second group of questions was directed to the actual statistical survey. Of a total of 15 questions, six were informative and 9 subject to statistical survey.

For finding the information on the awareness, randomly selected people were surveyed in emergency planning zones of nuclear facilities Temelín and Dukovany and also outside the emergency planning zones. Addressed people were selected according to age differentiation in four major groups:

a. from 15 to 18 years of age
b. from 18 to 40 years of age
c. from 40 to 65 years of age
d. over 65 years of age

Both groups of respondents in each group were divided into men and women and specifically addressed in the relevant numbers corresponding to the age structure of the population of the Czech Republic.

Table 1 Numbers of addressed groups according to age differentiation

Age of the addressed	Number of women surveyed	Number of men surveyed
from 15 to 18 years of age	21	21
from 18 to 40 years of age	63	84
from 40 to 65 years of age	84	63
over 65 years of age	42	22

Groups of people were surveyed throughout the day in order to classify not only all age groups, but also other specific groups such as workers, the unemployed, parents on maternity leave and the like.

3.1. Procedure for testing hypotheses based on descriptive methods and mathematical statistics

To achieve the objectives, the following hypotheses have been established:

H1: Knowledge about the problems of electrical power failure will be close to a normal distribution for people living inside the emergency planning zone

H2: Knowledge about the problems of electrical power failure will be close to a normal distribution for people living outside the emergency planning zone

For the hypotheses testing, we will proceed from the formulation of a statistical survey after scaling, measurement, empirical distribution of frequency and parametric and non-parametric testing along with double-selective parametric tests for testing the hypothesis of equality of mean values with unknown variances $\sigma 1$ and $\sigma 2$. Based on the theory of estimates, the unknown variances $\sigma 2$ and $\sigma 1$ will be estimated by empirical standard deviations Sx. A double-selective investigation allows to quantify the "closeness to normal distribution" in selected groups of respondents, and to compare the level of knowledge in selected groups of respondents. Concurrent application of methods of non-parametric and parametric statistics (non-parametric test of good concurrence, double-selective parametric test) is another reason for selecting this type of theoretical distribution.

3.2. Comparison of quantitative information with true awareness among the population in emergency planning zones (measurement)

Formulation of statistical survey

Statistical unit – a group of people in the emergency planning zone

Statistical character – the number of correct answers in the questionnaire

Value of a statistical character – 0 - 9 correct answers in the questionnaire

Basic statistical file – it was asked 400 respondents in the emergency planning zones. For statistical evaluation was used to 50 questionnaires

Random selection – was not implemented

Selective statistical file = basic statistical file

Scaling and measurement

Table 2 To perform scaling was used to quantitative metric scale

Groups	Number of correct answers	Number of population
1	1 or less	4
2	2-3	15
3	4-5	23
4	6-7	7
5	8 and more	1

Elementary statistical

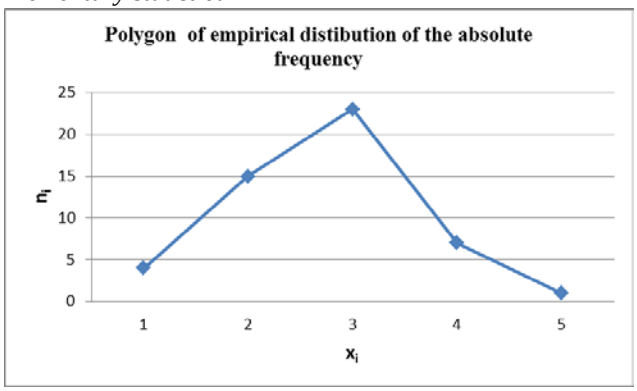

Figure1 Polygon empirical distribution of the absolute frequency

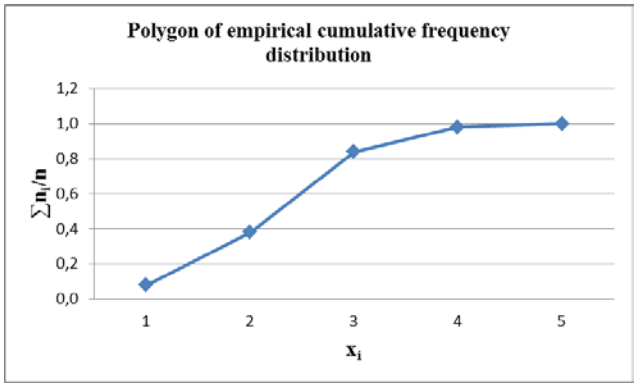

Figure2 Polygon empirical cumulative frequency distribution

Table 3 Empirical parameters

O	Value	C	Value	N	Value
$O_{1(x)}$	2,27	$C_{2(x)}$	0,762	$N_{3(x)}$	0,03
$O_{2(x)}$	8,16	$C_{3(x)}$	0,022	$N_{4(x)}$	2,93
$O_{3(x)}$	26,36	$C_{4(x)}$	1,7		
$O_{4(x)}$	90,48			exes	$N_{4(x)}$ – 3 = -0,07

(Sx=0,87)

Time - frequency distribution, the transition to a standardized normal distribution

The introduction of variable *u*

$u = (x\text{-}O_1)/Sx$

u_1= -1,39

u_2= -0,25

u3= 0,89

u4= 2,27

$u_5 = \infty$

Primitive functions

$F(u_1) = 1 - F(1,39) = 0,08 \rightarrow p_1 = 0,08 \rightarrow n\ p_1 = 4$

$F(u_2) = 1 - F(0,25) = 0,4 \rightarrow p_2 = 0,32 \rightarrow n\ p_2 = 16$

$F(u_3) = F(0,89) = 0,81 \rightarrow p_3 = 0,41 \rightarrow n\ p_3 = 20,5$

$F(u_4) = F(2,27) = 0,98 \rightarrow p_4 = 0,17 \rightarrow n\ (p_4 + p_5) = 9$

$F(u_5 = \infty) = 1 \rightarrow p_5 = 0,01 \rightarrow n\ p_5$ = combine with the 4th element of the array

Table 4 The values of the individual interval

x_i	interval	n_i	u_i	Φ(ui)	pi	npi
1	(-∞; 1,5>	4	-1,398	0,083	0,083	4
2	(1,5; 2,5>	15	-0,252	0,400	0,317	16
3	(2,5; 3,5>	23	0,894	0,810	0,410	20,5
4	(3,5; 4,5>	7	2,040	0,980	0,170	9
5	(4,5; ∞)	1				

Calculation $\chi^2_{exp} = 0 + 0,06 + 0,3 + 0,44 = 0,8$

Specification $\chi^2_{teor} = 3,84 \rightarrow \chi^2_{teor}$ is greater than χ^2_{exp}

It is possible to accept the null hypothesis H0 - knowledge of the respondents in the zone have a normal distribution

3.3. Comparison of quantitative information with true awareness among the population outside the emergency planning zone (measurement)

Formulation of statistical survey

Statistical unit – a group of people outside the emergency planning zone

Statistical character – the number of correct answers in the questionnaire

Value of a statistical character – 0 - 9 correct answers in the questionnaire

Basic statistical file – it was asked 400 respondents outside the emergency planning zones. For statistical evaluation was used to 50 questionnaires

Random selection – was not implemented

Selective statistical file = basic statistical file

Table 4 perform scaling was used to quantitative metric scale

Groups	Number of correct answers	Number of population
1	1 or less	5
2	2-3	9
3	4-5	20
4	6-7	13
5	8 and more	3

Elementary statistical

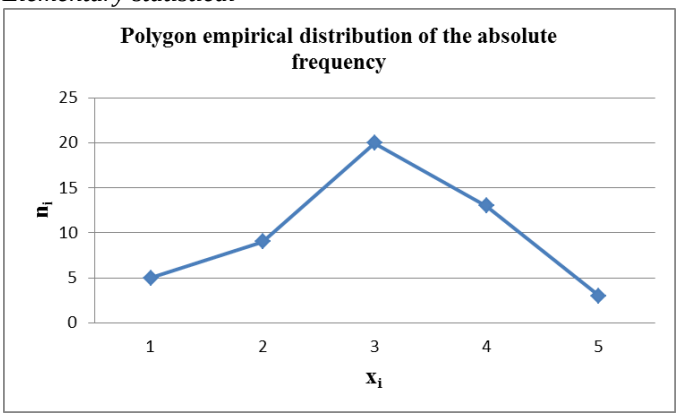

Figure 3Polygon empirical distribution of the absolute frequency

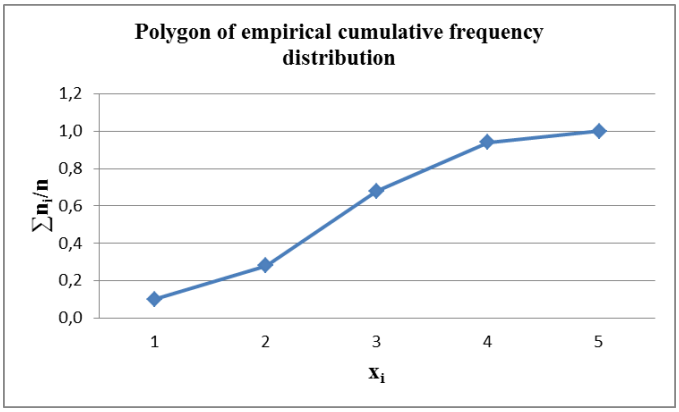

Figure 4 Polygon of empirical cumulative frequency distribution

Table 5 *Empirical parameters*

O	Value	C	Value	N	Value
$O_{1(x)}$	3,0	$C_{2(x)}$	1,08	$N_{3(x)}$	-0,21
$O_{2(x)}$	10,08	$C_{3(x)}$	-0,24	$N_{4(x)}$	2,57
$O_{3(x)}$	36,48	$C_{4(x)}$	3		
$O_{4(x)}$	139,4			exes	$N_{4(x)}$ – 3 = -0,43

(Sx=1,04)

Time - frequency distribution, the transition to a standardized normal distribution

The introduction of variable *u*

$$u = (x-O_1)/Sx$$

u_1= -1,44
u_2= -0,48
u_3= 0,48
u_4= 1,44
u_5= ∞

Primitive functions

$F(u_1) = 1 – F(1,44) = 0,075 \rightarrow p_1 = 0,074 \rightarrow n\,p_1 = 3,7$
$F(u_2) = 1 – F(0,48) = 0,0,316 \rightarrow p_2 = 0,242 \rightarrow n\,p_2 = 12,1$
$F(u_3) = F(0,48) = 0,684 \rightarrow p_3 = 0,368 \rightarrow n\,p_3 = 18,4$
$F(u_4) = F(1,44) = 0,982 \rightarrow p_4 = 0,241 \rightarrow n\,(p_4 + p_5) = 15,8$
$F(u_5 = \infty) = 1 \rightarrow p_5 = 0,01 \rightarrow n\,p_5$ = combine with the 4th element of the array

Table 6 The values of the individual interval

x_i	interval	n_i	u_i	Φ(ui)	pi	npi
1	(-∞; 1,5>	5	-1,443	0,074	0,074	3,700
2	(1,5; 2,5>	9	-0,481	0,316	0,242	12,100
3	(2,5; 3,5>	20	0,481	0,684	0,368	18,400
4	(3,5; 4,5>	13	1,443	0,925	0,241	12,050
5	(4,5; ∞)	3				3,750

Calculation $\chi^2_{exp} = 1,615$
Specification $\chi^2_{teor} = 3,84 \rightarrow \chi^2_{teor}$ is greater than χ^2_{exp}

It is possible to accept the null hypothesis H0 - knowledge of the respondents outside the zone have a normal distribution

4. Comparison of quantitative awareness with true awareness among the population outside an emergency planning zone (measurement)

Empirical data from previous statistical survey will be compared with each other. A non-parametric test of knowledge of the population in the zone of emergency shows proximity to the Gaussian distribution, the test of knowledge of the population living outside the emergency planning zone demonstrates Gaussian distribution.

For VSS1 is true:
$\mu_1 = O_1$=2,82
$\sigma_1 = Sx_1$=0,74

For VSS2 is true:
$\mu_2 = O_2$=3,0
$\sigma_2 = Sx_2$=1,04

Upon inserting the appropriate values into the formula of the double-selective parametric t-test as follows

$$t_{exp} = \frac{\mu_1 - \mu_2}{\sqrt{(n_1 - 1){S_{x1}}^2 + (n_2 - 1){S_{x2}}^2}} \sqrt{\frac{n_1 n_2 (n_1 + n_2 - 2)}{n_1 + n_2}}$$

$$W = \left(-\infty; -t_{n_1+n_2-2}(\alpha/2)\right) \cup \left\langle t_{n_1+n_2-2}(\alpha/2); \infty\right),$$

It is possible to obtain t_{exp} = -0,849

W = (-∞;-tn1+n2-2 (α/2)> U <tn1-n2-2(α/2);∞)
W = (-∞;-1,96> U <1,96; ∞)

Resulting TEXPA = -0,849does not belong to the critical field W, hence it is necessary to adopt the null hypothesis. In other words - the difference between knowledge of laymen and experts is at level α = 0.05 statistically insignificant.

5. Discussion

For the purposes of investigation, an analysis of individual questions included in the survey was carried out. The questionnaire contained questions investigating the issue of awareness of electricity black-outs (questions. 3, 4, 6, 7, 8, 9, 10, 11, 13) and questions aimed at obtaining general information (questions. 1, 2, 5, 12 , 14, 15). The conducted analysis and statistical survey led to the conclusion that the population in emergency planning zones of nuclear facilities has slightly less knowledge about electricity failures than the population living outside the emergency planning zone of nuclear facilities. Mistakes were most commonly made in questions no. 8 (Do you know how to provide drinking water for your household?), No. 4 (What will you do in case of a long power failure (several days) of electricity in your home), no. 6 (How will you take care of perishable food in your home in case of a prolonged power outage, especially in refrigeration and freezing devices?)

Hypothesis H1 - theoretical distribution of the knowledge of the population living inside emergency planning zones will be close to normal distribution - was validated and accepted by the carried out statistical investigation. The adoption of this hypothesis suggests that the respondents living inside emergency planning zones in given survey show a medium number of errors (of the total 9 possible errors), which has the highest probability. Larger and smaller number of errors of the detected middle value of the mistakes falls on either side of the middle value with a Gaussian decreasing probability. The value of the medium number of errors in an average citizen is possible to obtain by a transfer of the first common moment of the 1st grade (arithmetic mean) of the elements of the scale to the values of the statistical character. The mean number of errors in this case is 4 out of 9 possible errors.

Hypothesis H2 - theoretical distribution of the knowledge of the population living outside emergency planning zone will be close to normal distribution - a statistical survey has confirmed a normal distribution. The respondents living outside the emergency planning zone in given questionnaire survey show the mean number of errors as well as the people living inside emergency planning zones (out of 9 possible errors), which has the highest probability. Larger and smaller numbers of errors of the detected middle value of the mistakes fall on either side of the middle value with a Gaussian decreasing probability. The value of the medium number of errors in an average citizen is possible to obtain by a transfer of the first common moment of the 1st grade (arithmetic mean) of the elements of the scale to the values of the statistical character. The mean number of errors in this case is 4 out of 9 possible errors.

The results show slightly larger number of errors in the questionnaires of the people living in areas of emergency planning. It is necessary to prepare and inform the people how to behave during a power failure and how to prepare their homes for power outages.

Hypothesis H3 examined the assumption that the comparison of knowledge about electricity outages in the population inside and outside areas of emergency planning will lead to adoption of alternative hypotheses. Statistical investigation showed that the experimental value of the applied test criterion, which was a double-selection t-test, lies within the specified critical field. The calculated value of the experimental test criterion is -0.99. As a result of this investigation, hypothesis H3 was not verified and accepted. The knowledge of electrical power outages is the same at the significance level α = 0.05. The sub-objectives of the project are based strictly on the main goals and their purpose is to promote solutions to the key challenges: 1) to carry out an analysis on contact basis of population differentiation in a selected area in terms of representation of different categories of the population - with disabilities, by age and population in work age; 2) to analyze the possibility of evacuation planning; 3) to analyze new possibilities of medical support of evacuation; 4) to analyze public awareness and preparedness for emergencies and crisis situations in connection with failures of critical infrastructure elements; 5) to analyze the ethical issues of evacuation planning; 6) to determine the tasks of public administration involved in evacuation planning and public awareness; 7) the identified partial results of the project will be continuously discussed with the representatives of responsible central administrative offices and will serve to update the methodologies and guidelines and, in particular, as a support for the upcoming legislative amendments to the relevant legislation. Individual changes will be assessed continually in the training, which will be summarized at the end of the training ZONE 2016 JE Temelín.

V. Conclusion

The pilot project results, which are presented here, imply that awareness of two main groups of population of an incident - a power failure - is not statistically significant. The awareness of people living inside and outside emergency planning zones is almost at the same level. From a practical point of view of research, Czech citizens know little about this incident. They do not know the basic principles of food safety. They do not know where and how to obtain information about the current situation. There is also a large group of the population physically dependent on the supply of electrical energy, such as people with artificial kidney. In an emergency, we should deal with these people as a matter of priority and individually. It is necessary to prepare a frugal manual for the population to provide the people information how to get ready in case of power outages and to know how and what to do during a power failure.

The severe accidents which happened in Chernobyl caused a huge increase in safety requirements. It is expected that they will be even stricter after the accident occurring at nuclear power plant Fukushima 1. [11] Special attention in the project is paid to specific needs of individual age groups and sensitive approach to them while respecting ethical principles in the evacuation of the population. An important source of problems may also be loss - disruption – of some elements of critical infrastructure. It turns out that the majority of the population does not have enough knowledge of electricity outages. They do not know how to behave during power outage, how to secure their home or how to ensure safe food and drink. In a situation such as long-term power outage, the population will need to be disciplined for the situation to be adequately managed with the smallest impact possible. One possibility is a ready citizen.

Evacuation, as the most effective measure to protect the life and health of citizens, must be prepared and implemented according to the latest knowledge and experience from the Czech Republic and the world, and that is the goal of the research project "Population Protection According to Population Differentiation"

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