

SURVIVAL SKILLS IN EVENT OF NATURAL DISASTER

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Abstract. Civil protection aspects in cases of various natural disasters are becoming increasingly relevant in Latvia. Medical, accommodation and catering facilities are located in large cities and regional centres. They can be accessed on foot or by bicycle. In less populated areas, residents must rely on their own resources and those of the surrounding community. The civil protection risk management systems of Western Europe and the USA provide for the development of residents' skills so that they can survive for several days after a natural disaster without energy resources. They can provide first aid, build a shelter in a forest or park from natural materials, are able to independently access pre-prepared food supplies and, using firewood or candles, can cook a hot meal, can prepare drinking water in different seasons, can wash clothing and linen in open water and dry them by a fire, as well as repair them with a needle and thread, and they can understand the specifics of the seasons and orient themselves in their surroundings. The aim of the study is to determine whether the population of Latvia has sufficient understanding of the consequences of disasters and the competence to provide for their basic needs. To achieve this, expert interviews and expert assessments were conducted. The study revealed that the population of Latvia rely more on the timely involvement of specialized services (city and municipal councils, State Fire and Rescue Service (VUGD), Emergency Medical Service (NMPD), municipal police, army) to remediate the consequences of disasters and do not see their participation in these processes.

Keywords: civil protection, survival skill, natural disaster.

Introduction

Previous studies have shown that natural disasters have significantly more consequences for the civilian population of Latvia [1]. Studies have been conducted, but the data have not yet been published (submitted for publication) to show that many civilians have knowledge of how to act in case of disasters but lack the skills to apply this knowledge. This means that it is necessary to improve the competence of civilians.

Research [2] indicates that in the event of floods during wartime, there is a high probability that urban areas will be inundated. This indicates the need to consider the safety of civilians in the event of these disasters.

A similar study was conducted in Poland [3], where solutions were sought – three different types of flood resistant structures: buildings on piles, amphibious buildings and floating buildings. The study found that a building on piles has the greatest margin of safe operation – it can be used regardless of the water level, even during seasonal floods.

Studies have been conducted in Italy on natural disasters caused by earthquakes [4], especially in situations caused by aftershocks. It is important to determine the correct preventive measures so that the earthquake does not cause damage to civilians and culturally meaningful and historical buildings.

The study [5] indicates that a new notification system was developed to coordinate with responsible agencies and non-governmental organizations to ensure a comprehensive response. The speed and efficiency of the response are ensured by the Agentive Large Vision Language Models (LVLMS).

Similarly, in the United States [6], since the September 11 attacks large-scale disaster simulations have been held annually in selected metropolitan communities, using a wide range of scenarios from plane hijackings to gas attacks. These major events are designed in great detail and involve all relevant services, including fire, police, medical rescue and hospital services.

Based on the analysis of publications, the aim of this study was set: to determine whether the population of Latvia has sufficient understanding of the consequences of disasters and the competence to secure their basic needs.

Materials and methods

The analysis and evaluation of the research revealed that Latvian residents rely more on the timely involvement of specialized services (city and local government councils, State Fire and Rescue Service (SFRS), Emergency Medical Service (EMS), local police, army to eliminate disaster consequences and

do not see their participation in these processes. To achieve the goal, expert interviews and expert evaluations were conducted. Seven experts were selected based on experience in civil protection, disaster management and involvement in the development of preventive measures. Three of them were representatives of the State Fire and Rescue Service (SFRS), two were from the Emergency Medical Service (EMS) and two from municipal civil protection commissions (CP). The characteristics of the experts are given in Table 1.

Table 1

List of experts

Experts	Experience		Gender	Age, years	Education, qualifications
	Position	Years of work experience			
A	SFRS	29	male	51-60	Master's Degree
B	CP	4	male	31-40	Bachelor's Degree
C	CP	3	female	31-40	Bachelor's Degree
D	SFRS	22	male	41-50	Bachelor's Degree
E	SFRS	35	male	51-60	Master's Degree
F	EMS	18	male	41-50	Bachelor's Degree
G	EMS	21	female	41-50	Bachelor's Degree

In order to evaluate the importance rankings of the components of civil protection disaster management competence, statistical processing of the data was performed. The processing determined non-parametric statistics of the data: medians Me , modes Mo and amplitudes A [7]. The consensus of expert rankings of the importance of the competence components is characterized by the Kendall concordance coefficient W and its significance level [8]:

$$W = \frac{12S}{m^2n(n^2 - 1)}, \quad (1)$$

where W – Kendall's concordance coefficient;
 S – sum of squares of all ranks;
 m – number of experts;
 n – number of variables.

Results and discussion

Based on the research [9], it was found that expert scientific knowledge is rapidly becoming an integral part of disaster management, and the role of science in disaster risk reduction at the policy level is changing. However, the most important issues that need to be addressed in disaster risk reduction are knowledge transfer, disaster expertise and risk awareness.

Therefore, an interview of the experts was conducted, in which the main findings are:

Expert A: Residents are happy to use and understand the safety issues they experience on a daily basis. Fire safety equipment, fire extinguishers, fire blankets, alarm buttons, evacuation plans in rooms, plans in a facility, fire hydrant boxes and hydrants are common elements of the urban environment, in public buildings, public transport, and gas stations. Residents have seen them since childhood. Practical training is regularly held in educational institutions and workplaces. There is a lot of information on television and mass media about accidents and the actions of residents in them. People gradually develop skills for action in the event of a fire. The same is true with first aid skills. There is a lot of information about the sequence of actions, materials and methods to be used. First aid medical material kits are available in workplaces and in public transport. People are introduced to the basics of providing first aid through training organized by an employer or through driver training. But the ability of residents to act in an emergency situation is minimal, because the emergency situations themselves, the consequences of which would require residents to urgently leave their place of residence for a long period of time, are not regular. Usually, emergency situations are explosions of natural gas distribution systems and heating boilers inside buildings, sudden spring floods and subsequent power distribution system disconnection, the consequences of a powerful summer storm and hail, broken trees fallen on roads, and icing that makes driving conditions difficult. The consequences of such disasters are corrected by public services,

and private individuals do not develop the skills to handle the aftermath as the equipment required is often bulky and expensive. The residents' skills to survive in the open air at any time of the year are minimal. When a person gets lost in a forest or swamp, especially in a season other than summer, freezing occurs, because a person going into nature did not foresee such troubles in advance. He does not have the necessary equipment to make a fire. People have no idea that you can climb the highest point in the area or a tall tree to improve mobile communications. The majority of residents still do not have special services applications on their smart devices.

Expert B: It has been observed that residents at workplaces are willing to get involved and provide first aid, stop minor bleeding and call the nearest medical facility or NMPD. Residents in the private sector have installed smoke detectors and have arranged electrical safety measures in their homes.

The situation is somewhat worse with understanding how to act in emergency situations, because such situations are rare and there is little chance of experiencing a precedent in one's place of residence. A specific, well-equipped place would be needed where residents could familiarize themselves for a relatively long time (4-6 hours) with the manifestations of an emergency situation and its consequences.

Expert C: Residents understand the topic of fire safety because they work with it every day and so the ability to act in the event of a fire is assessed as very good. Regular evacuation and practical firefighting trainings are held, fire safety equipment is clearly visible at work, in cultural and entertainment institutions, shopping centres, and in the urban environment. Residents understand why there are red metal manhole covers on the roadway or pedestrian sidewalk under which hydrants are located. Residents are confident in knowing the short emergency number for calling special services and being able to name the exact address where the service should arrive.

Expert D: I have observed that residents are well prepared for action in the event of a fire. In real situations, they willingly free up space for fire trucks, make sure that firefighters get as close to the fire as possible with their equipment. They open gates, remove yard barriers or other obstacles that make it difficult to enter the facility. Residents rely heavily on the operation of smart phone maps, route planners, etc. and are poorly oriented in unfamiliar areas, do not pay attention to place names, river names posted at bridges, public transport stops, the names of the nearest houses.

Expert E: I have very good experience with the actions of residents in an emergency situation when a toxic chemical leak was reported in the city. The evacuation from the city took place very peacefully, without excesses, violence or looting. Residents, even in the darkest periods of the day in the autumn and winter, do not actively use light reflectors or very brightly coloured clothes. Equipped in this way, they participate in road traffic, often on the wrong side of the road. Residents frequently spend a few hours a day in the forest, walking along specially created trails or forest roads. They do not have special shoes or clothing. "Street" shoes and "home" clothing are used. In my opinion, it is necessary to create a community of residents, a disaster management education centre for residents of urban neighbourhoods, perhaps using private-public partnerships at the municipal level.

Expert F: It has been my experience that during daylight hours, visitors or residents of adjacent buildings have evacuated and are standing at a safe distance from the burning object. Providing first aid to residents is focused on a small number of injured people - one or two, no more. With a larger number of injured people, confusion arises as to who is a "priority case" and which victim can wait in line for a while. The stock of available medical supplies and materials is also small, it is not intended for the treatment of massive deep, lacerated wounds and stopping bleeding.

Expert G: Safe, correct behaviour in cases of fires is the result of regular training. Both in private business and state administration institutions. Regularity, together with analysis of training results, creates fire safety competence in residents, which cannot be said about survival skills. It is necessary to create an environment in which residents could learn survival skills in conditions similar to the aftermath of natural disasters. Residents rely on the availability of services in various crisis situations. Residents lack understanding that special transport does not travel through deep snowdrifts, and will not promptly arrive at a private house in deep fields or forests along a disintegrating country road or a road blocked by trees blown down by a storm.

Additionally carried out was statistical processing of the data on the importance of the components of civil protection disaster management competence. The results are presented in Table 2.

Table 2

Results of expert evaluation

Components of competence	Experts							Ranks L_i	Ranks rank	Median M_e	Mode M_o	Amplitude A
	A	B	C	D	E	F	G					
	Level (rank)											
Survival skills	1	1	1	2	1	2	1	9	1	1	1	1
First aid skills	3	4	3	3	3	1	2	19	3	3	3	3
Firefighting skills	4	3	4	4	2	4	4	25	4	4	4	2
Emergency response skills	2	2	2	1	4	3	3	17	2	2	2	3
Total	10	10	10	10	10	10	10	70	10	x	x	x

The Kendall's concordance coefficient significance level $W = 0.45$ ($p < 0.05$). In the expert assessment of competence rankings: survival skills are of significant importance (1), followed by skills to act in an emergency situation (2), first aid skills (3), and skills to act in the event of a fire (4).

When analysing the differences between expert opinions regarding survival skills and emergency response skills, differences are evident ($p < 0.08$).

The results of the analysis of the study [10] indicate that, similarly to our study, it is necessary to improve education by including training in the acquisition of survival skills and resilience in the event of a crisis. This means that the ability to adapt to the situation must be acquired. Improving education by introducing digital technologies in the event of earthquake disasters [11] and developing virtual reality (VR) applications to educate civilians about flood safety, design, and assessment improves their survival skills and knowledge [12].

Similar studies have been conducted in Spain and have identified the need to integrate content on sustainability, climate change and disaster risk reduction into Spanish education legislation and other specific provisions in the field of civil protection – harmonization with international regulations, such as the 2030 Agenda for Sustainable Development [13].

According to experts, in the districts of municipalities, there is a need for a place where community education events can be organized, a building to which community representatives go on a daily basis, driven by some other motive. As a result, this place can also be found in post-disaster conditions - in heavy fog, snowfall, smog, floods. A building that stores the survival equipment and materials provided by the municipality for the community of residents. A building that has withstood damage caused by natural, technogenic or other disasters. A building that can be operated without centralized electricity supply, while at the same time not losing internal lighting and outdoor air circulation. An ergonomic building made of renewable building materials available in Latvia (e.g., solid wood, boards, plywood, CLT panels, and pressed peat). Our offer is a wooden multi-storey office building – a car park.

Conclusions

1. The population of Latvia relies more on the timely involvement of specialized services (city and municipal councils, State Fire and Rescue Service (VUGD), Emergency Medical Service (NMPD), municipal police, army) to overcome the consequences of disasters and do not see their own participation in these processes.
2. In the experts' assessment, survival skills were significantly more important ($p < 0.05$).
3. Further research is needed to develop the most appropriate methods for educating Latvian civilians and the possibilities for constructing a functional, ergonomic civil defense building.

Author contributions

Conceptualization, U.K. and D.B; methodology, D.B. and U.K.; software, U.K.; validation, U.K. and D.B; formal analysis, U.K. and D.B.; investigation, U.K., D.B.; data curation, U.K.; writing – original draft preparation, U.K.; writing – review and editing, U.K. and D.B.; visualization, U.K.; project

administration, U.K.; funding acquisition, U.K. All authors have read and agreed to the published version of the manuscript.

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