

Civil protection training and international experiences in the context of climate change

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Abstract— In today's rapidly changing world, protecting the lives and values of the civilian population is a task of paramount importance. Society is threatened by an increasing number of hazards, including natural disasters, epidemics, armed conflicts, and technological crises. In recent years, we have all experienced the effects of the global pandemic and the consequences of the war in a neighboring country, which have highlighted the importance of preparedness. Civil protection can play a key role in preparing the population, particularly through education and training. Raising public awareness, recognizing emergencies, and learning how to respond appropriately are essential to mitigating the effects of disasters. In the following, we will focus primarily on the risks posed by climate change and examine the training opportunities available in the field of civil protection. In addition, we will use international examples to illustrate the experiences of other countries in preparing the population and managing risks.

Keywords— Civil protection; climate change; education

I. INTRODUCTION

The aim of the study is to explore how climate change affects civil protection education tasks and opportunities. The study also aims to identify international best practices that can be applied in Hungary or that can complement the opportunities already available in our country. Following a review of European literature, the study is based on an analysis of the documents uncovered.

The world around us is constantly changing and transforming. This transformation affects almost every area of our lives. Our economy, society, and the expectations of generations within it are constantly changing [1], but our environment is also undergoing transformation.

In many cases, these transformations and changes paint a positive picture. Think of advances in science, transportation, and the emergence of new drives alongside safety and cognitive transportation [2]. Of course, the list could go on and on.

Unfortunately, however, there is another side to the coin, where the changes also have negative consequences. There are numerous facts that could be presented here. One particularly shocking negative fact can be found in the WWF's Living Planet Report, which shows a 73% decline in the average size of observed wildlife populations in just 50 years [3]. This ecological change certainly has and will continue to have an impact on our lives. Ecological change is not only evident in the decline or extinction of species, but also in the fact that changes and transformations in habitats can lead to new

threats in certain areas. One example of this is the new species of tick that has been found in Hungary [4].

People and society must adapt to changes in the environment and circumstances surrounding us. Adaptation is also necessary because a significant proportion of these transformations pose a threat to society and to individual members of society alike. These threats can seriously endanger not only human life, but also economic assets. Furthermore, they can pose a threat to the stability of society.

Threats can basically be divided into civilizational, human, and environmental threats [5]. Human threats include events such as terrorism, wars, and disinformation campaigns. Civilizational threats include industrial disasters and critical infrastructure exposure. Natural hazards include earthquakes and extreme weather events.

Hungary can be considered a safe place in terms of man-made emergencies. Our country ranks high in two data sets published on the Vision of Humanity website. The Global Peace Index gives Hungary a score of 1.5 in 2025, making it the 17th most peaceful country in the world. Similarly, Hungary scored 0 on the Global Terrorism Index based on data from 2024. For both indicators, the lower the score, the safer the country is [6]. Of course, this does not mean that Hungary does not have to deal with these threats.

In the following, we will focus our attention on natural hazards due to the above reasons. Considering that natural hazards can cause serious material damage and, unfortunately, also claim human lives.

The European Environment Agency published statistical data on economic and human losses in 2024. According to the data, between 1980 and 2023, the 27 member states of the European Union suffered economic losses of €738,280 million due to extreme weather and climate events. This amounts to an average of more than €17,169 million per year. This is a significant figure, but when we add the number of human casualties, which is 241,587 [7], even developed countries have to reckon with these dangers.

II. CHANGES IN THE WEATHER IN HUNGARY

Since measurements began in 1901, numerous changes and transformations have been observed in Hungary's weather. These changes are examined by meteorology using several indicators and measurements. In the following, we will briefly focus on just two areas (temperature changes and changes in precipitation) to illustrate these changes.

A. Changes observed in Hungary's temperature data

In Hungary, temperature data series show several data points and trends. From this vast amount of data, we focus primarily on high and low temperature data.

Signs of warming are particularly evident when examining heat indices [8]. Over the past 123 years, the number of hot days, when the daily maximum temperature reaches or exceeds 30 °C, has increased by more than 15 days per year. Hot days, when the maximum temperature reaches or exceeds 35 °C, have also become more frequent, increasing by more than 2.5 days. In addition, tropical nights, when the daily minimum temperature does not fall below 20 °C, have become more frequent by more than 2.4 days.

At the same time, cold indices [9] show a downward trend. The number of frost days, when the daily minimum temperature is 0 °C or lower, has decreased by more than 20 days. The number of harsh days, when the minimum temperature is -10 °C or lower, has decreased by more than 8 days. The number of winter days, when the daily maximum temperature does not exceed 0 °C, has decreased by more than 9 days.

The above data clearly shows the direction of climate change: the number of warmer days is increasing, while the number of colder days is decreasing. This trend is evident not only in statistical data, but also in everyday experience.

B. Trends visible in precipitation distribution in Hungary

To illustrate domestic precipitation conditions, we used weather data for Hungary published by the Central Statistical Office [10]. During the study, we examined the number of rainy days and the amount of precipitation measured in millimeters. Rainy days are defined as days when the amount of precipitation was at least 0.1 millimeters.

During the investigation, the data from the database was plotted on a graph, followed by the addition of a linear trend line. The trend line helps to determine the nature of the changes in the data. After examining the data, we can make the following observations.

- A slight decrease in the amount of precipitation over the course of a year can be seen based on the trend line.
- There has also been a decrease in the number of rainy days. In other words, we can expect fewer and fewer rainy days over time. This decrease is even more apparent when we examine the 10-year moving average of the number of rainy days. Since measurements began, the 10-year moving average of rainy days has fallen from around 170 days per year to less than 140 days per year.
- However, the amount of precipitation falling on a single rainy day has increased. Based on the data, it can be concluded that the amount of precipitation per rainy day has increased by more than 0.5 millimeters.

This is also supported by an examination of the occurrence of heavy rainfall over a single day. According to data from Hungaro Met Zrt, the number of days when precipitation exceeds 20 mm, 30 mm, or even 40 mm per day has increased over the past 120 years [11].

C. Hazards arising from the expected weather conditions in our country

Trends are emerging from meteorological measurements taken in our country over more than 100 years. Warming is becoming increasingly prominent in our weather, while colder periods are gradually decreasing.

Furthermore, the amount of precipitation is decreasing minimally, but the amount falling in each period is increasing.

The following dangers can be deduced from the two changes mentioned above. On the one hand, warming weather and decreasing precipitation increase the risk of drought. This is compounded by the fact that the disappearance of frost periods in winter increases soil drying. On the other hand, dry soil and large amounts of precipitation falling at once increase the risk of floods and flash floods.

These risks, along with other much broader risks, are included in Hungary's disaster risk assessment report [12] among the risks associated with extreme weather and water. In addition to the risks of drought and flash floods, these include, among others:

- Severe storms
- Extreme temperatures
- Forest fires
- Hailstorms
- Flooding
- Inland flooding.

We must adapt to these changing weather conditions and prepare to mitigate the damage. As Schweickhardt Gotthilf writes: "*Climate change is transforming the weather in our country, and with it, our defenses against natural disasters*" [13].

III. DISASTER MANAGEMENT AND CIVIL PROTECTION

From the above, it is easy to understand that it is necessary to establish a defense system and develop the existing system in our country as well. Currently, the disaster management system provides the space and opportunity for these activities in our country.

At present, these activities are regulated by Act CXXXVIII of 2011 on disaster management and the amendment of certain related acts.

Under the above-mentioned legislation and supplementary regulations, three major areas can be distinguished within the field of disaster management:

1. fire protection,
2. civil protection,
3. industrial safety [13].

Two of these three areas, fire protection and civil protection, have a long history, as there are written records of fire protection dating back to the reign of Stephen I. Organized fire departments began operating in Hungary in the 1870s.

The first steps in civil protection can also be traced back to the last century, when this protective activity began with the organization of air defense [14].

According to Section 3(20) of the legislation:

"Civil protection: a system of tasks, tools, and measures for society as a whole, the purpose of which is to protect the lives of the population in the event of a disaster or armed conflict, to ensure the conditions for survival, and to prepare

the population to overcome the effects of such events and create the conditions for survival." [15]

From the above definition, we can see that civil protection activities are very diverse and cover a wide range of tasks. Without claiming to be exhaustive, civil protection must perform the following tasks in relation to climate change:

- preparing the population for the rules of conduct necessary during defense,
- providing information, warnings, and alerts,
- maintaining protective structures,
- participating in the evacuation of the population, organizing relocation and reception if necessary,
- ensuring the protection of goods necessary for subsistence (water, food, feed, medicines, etc.),
- providing first aid,
- disinfection.

In addition to the above, civil protection also performs several activities that support defense and the maintenance of public services [13].

Civil protection may involve individuals in these tasks on a voluntary or compulsory basis. The individuals involved may perform various types of tasks, which can typically be divided into the areas of information and communication, civil protection, logistics, health, and technical and damage assessment activities.

IV. CIVIL PROTECTION AND EDUCATION

The previous chapter showed that climate change makes it necessary to prepare and inform people, as our weather and climate are changing. As a result, our country must reckon with risks that are becoming increasingly severe and, in some cases, more frequent.

We can also see that civil protection, operating within the disaster management system, can provide the appropriate organizational background and knowledge.

If this can be achieved, a more resilient society that recognizes dangers and responds to them appropriately can be developed. In the following, we will review some international examples that may be useful and worthy of consideration in our country, without claiming to be exhaustive.

Manuel Ribeiro, Paulo Gil Martins, and Ana Paula Oliveira provide a comprehensive analysis of the engineering approach to civil protection in a world struggling with digitalization and the phenomenon of volatility, uncertainty, complexity, and ambiguity (VUCA) [16]. According to their approach, the education of civil protection engineers should be based on three important pillars, namely:

- Scientific research on hazards and risks,
- Practical training,
- Development of civic competencies and active social participation.

These can be used to increase society's resilience, as well as the culture of safety and its acceptance. It thus plays a key role in creating a safer and more resilient society.

In their paper, they emphasize the importance of information and communication technology and the fact that technological progress simultaneously increases security and creates new risks.

A subsequent paper examining the adult and continuing education system for civil protection in Germany [17] comes to some interesting conclusions based on a systematic review of the literature.

Among other things, the current civil protection training and its decentralized status can be traced back to the period following World War II. According to the study, both civil protection and adult education are decentralized in Germany. As a result, many institutions and numerous actors are involved. They emphasize that adult education plays an important role in the training of both the public and professional staff. Furthermore, adult education can help increase the resilience of the population, especially in the era of climate change and hybrid warfare.

A study on the Czech Republic presents a completely different approach to civil protection than previous studies. Tomáš Milář and Peter Marinič [5] show that disaster risk reduction has been included in primary and secondary school curricula in the Czech Republic since 2010. The education of Czech students in this area plays an important role in building the population's resilience to various types of disasters.

In addition to highlighting the importance of disaster management training in the education system, the authors also mention that local governments hold training courses. Furthermore, the authors feel it is important to emphasize that training the population is not enough. To provide adequate theoretical and practical training, it is also necessary to provide appropriate training to students in teacher training colleges. They will be the ones who pass on and convey this knowledge to students.

The study emphasizes that education is essential if we want to build and develop the population's resilience to disasters.

V. CONCLUSION

Based on the findings presented in the introductory section of this study, it can be concluded that Hungary must consider the risks and dangers arising from climate change, as well as the potential disasters that may result from them. Of course, this does not mean that other risks, such as terrorism and industrial disasters, should be ignored. However, climate change is likely to increase the occurrence and potential of natural disasters.

We have also seen that the domestic legal and organizational environment provides disaster management, and within that, civil protection, with sufficient scope and opportunity to equip members of society with the knowledge to deal with such disasters.

We then saw some practical examples of how this preparation and knowledge transfer is manifested at the international level.

A. Experiences and recommendations for the development of the domestic education system

It is probably important to train professional civil protection engineers who have special multidisciplinary knowledge, as we can see in the article by Manuel Ribeiro,

Paulo Gil Martins, and Ana Paula Oliveira [16]. In Hungary, the disaster management training program at the National University of Public Service does not have this name, but it takes a similar approach. This training is available at both the bachelor's and master's levels. Within the bachelor's program, the disaster management operations specialization provides detailed knowledge related to civil protection.

Lacher and Rohs describe a practice in Germany [17] that offers opportunities for teaching disaster management and civil protection skills in adult education. Such skills can also be acquired in Hungary. In the new training structure, relevant training courses can be found among the professional qualifications that can be obtained through vocational training organized by vocational training institutions or adult education centers. These include the Disaster Management Assistant qualification and the Disaster Management Administrator qualification, which builds on this training. Although these courses are only classified as secondary education, they are still an effective way of imparting a broader range of knowledge on the subject.

The example presented and described among the international examples reported that the Czech education system already includes disaster management and civil protection training in primary and secondary schools [5]. In Hungary, the National Core Curriculum [18] includes the concept of disaster management as a key concept within the subject of civics. However, it is clear from the structure of the subject that this is not its main content. It can therefore be clearly recommended that the next revision of the National Core Curriculum should place greater emphasis on teaching disaster management and civil protection.

The Czech example [5] also states that to increase society's resilience to disasters, this area must be clearly reflected in teacher education and training. I have not found any relevant information on the transfer of such knowledge in the field of teacher training in Hungary.

Based on the above, it can be recommended that Hungarian higher education institutions providing teacher training broaden the knowledge they impart to include such topics. One possible solution would be for institutions involved in disaster management training to advertise continuing education courses for educators, instructors, and teachers specifically related to disaster management and civil protection. The importance and significance of this is stated in an article by László Bérczi and Krisztina Kállai, according to which one of the tools for creating a resilient society is, among other things, the establishment of a stable education system [19].

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