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Assessment of Emergencies Threatening a Particular Region

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1. Introduction

Civil protection can be defined as a system of tasks and measures aimed at protecting life, health and property, in particular by analysing possible threats and by taking measures to reduce the risk from threats, as well as by identifying procedures and actions to address the consequences of emergencies.

This topic is relevant to the whole world and is therefore addressed by experts to find solutions, measures and procedures to prevent or deal with emergencies that have already arisen.

As the role of civil protection is to protect life, health and property and to create conditions for survival in emergencies, the role of health care facilities in this context (Vichova & Hromada 2018) as well as the quality of emergency supplies (Bai et al. 2018, Šimko 2014) should also be addressed. An interesting paper is "Preparedness against Mobility Disruption by Floods", which addresses the safety of people in an urban emergency (Arrighi et al. 2019), and it is necessary to consider the innovative links between data and information serving to aid assessment of the impacts and risks on the urban environment (Li et al. 2019, Straka et al. 2019).

Natural disasters relating to long-term changes in temperature and changes in sea levels at global level are also the subject of world-wide research (Yuan et al. 2017), and this is confirmed by experts Huang, Hall and Berg, who have been working on research to address the effects of temperatures on flood risks (Huang et al. 208). Among natural disasters, the opposite of floods is a period of drought, which is also a very interesting phenomenon due to the extreme diversity of its severity and duration (Trinh et al. 2017). The issue of floods also affects the area of the province of Concepción (Chile), where this disaster affected the local population (Lara et al. 2017). Analysis of floods on the River Elbe has

drawn the attention of the experts Mudersbach, Bender and Netzel 2017, while the consequences of several extraordinary major storm events in New Jersey are described in the conference paper by Primm, Molloy and Carlin 2017.

Fires are also a natural disaster and fire protection itself needs to be addressed to provide a specialized response to such emergencies (Tomescu et al. 2019). An interesting study that examines the future of fire safety is from Olawoyin (Olawoyin 2018), and the Australian experts Johnson and Lobel also address this issue (Johnson & Lobel 2018).

A method for assessing the risk of catastrophic slope failure can be found in the article "A novel risk assessment method for landfill slope failure: Case study application for Bhalswa Dumpsite, India" (Jahanfar et al. 2017).

Another contribution in the field of emergencies focuses on assessing urban seismic vulnerability (Lorenzo 2017).

The study "Assessment of attack likelihood to support security risk assessment studies for chemical facilities" concentrates on the area of industrial accidents, which is an integral part of the assessment of safety risks in urban areas (Landucci et al. 2017), while an article by the National Institute of Occupational Safety and Health provides information on legislative processes related to the issues addressed (Van Wely 2017).

The possibility of terrorist attacks forms part of the environmental safety assessment. In "Small-building defense against terrorism" (Lawless & Gumpertz 2006) we learn about sophisticated methods of protection against terrorism based on risk assessment and various defence mechanisms. The aim of the paper "Reducing the attractiveness of chemical plants to terrorist attacks: Dehorning rhinos" was to highlight terrorist attacks on chemical factories, which are a major threat to the population (Khakzad 2018).

Kovacs and Moshtari, considering the significant costs of natural disasters and man-made disasters, decided to create a methodological perspective (Kovacs & Moshtari 2019).

It is necessary to consider the importance of links and cooperation between local and state institutions in disaster management (Shah et al. 2019) and the related human resources management needs (Tomčíková et al. 2018).

2. Theoretical basis

2.1. Emergencies and their impact on the environment

An emergency is often a very serious, time-consuming and spatially limited event, caused by a natural disaster, technical or technological accident, operational failure, or deliberate action by a person that has caused disruption of

system stability or of ongoing events and activities. This event threatens people's lives and health, material and cultural goods or the environment.

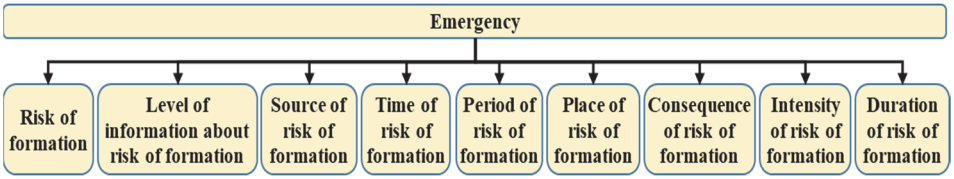

Fig. 1. Emergency Factors (Frištiková 2006)

These factors (Fig. 1) accurately define the cause, time, period, level of awareness. They determine the impact, intensity and duration of each given incident. They provide important information to understand the nature and course of an emergency, to seek precautionary measures, tools and procedures for effective and efficient solutions. General factors in an emergency are phenomena that describe it and are characteristic of it from the perspective of the subject in question.

2.2. Classification of emergencies

A natural emergency is an extraordinary event caused by natural forces, resulting in the release of accumulated energy and matter, or the action of dangerous substances, or other destructive factors with a negative impact on humans, animals, material values and the environment (Nemčok et al. 1974).

The most common natural emergencies include:

- floods (from precipitation and watercourse),
- atmospheric disturbances (storms of various types, extreme cold and heat, drought),
- landslides and slope movements,
- earthquakes and volcanic eruptions,
- destructive fires.

The main processes affecting natural emergencies are:

- rapid movements of mass (earthquakes, landslides, slope movements),
- release of tectonic energy and its transfer to the surface (volcanic eruptions, earthquakes),
- increase in the water levels of rivers, lakes and seas (floods and tsunamis),
- atmospheric equalization of temperature differences (atmospheric disturbances, destructive fires) (Poledňák & Orinčák 2011).

Other random phenomena and processes that would endanger the lives and health of people, disrupt the life of society, or damage material values:

- civil unrest,
- terrorist acts,
- the collapse of large manufacturing organizations,
- stoppage of the supply of strategic raw materials from abroad and the consequent lack of certain products on the market,
- large-scale epidemics (mass illnesses of humans or livestock), etc.,
- spreading of false alarms,
- migration.

3. Case study

3.1. Analysis of the risk of emergencies in Bratislava Region

At the beginning of this analysis of the Bratislava region it is necessary to provide an economic and geographical description of the territory. All sectors of traditional industrial production are represented in the economy of the studied area. The most important industries include the chemical, automotive, engineering, electrical and food industries. Recently, the Bratislava region has developed into a European centre for automotive production. The structural changes in the region's economy include the increasing importance of the tertiary sector, particularly in trade and services, banking and insurance. Agricultural production is mainly focused on winemaking and, to a lesser extent, on crop and livestock production. Another major industry is the construction industry.

From the geographical point of view, it is important that Bratislava region is on both banks of the Danube River, the second largest river in Europe, at the foot of the Small Carpathians and it occupies the margins of the Záhorie and Danube Plains at coordinates of 48° 9' north and 17° 7' east, spreading over an area of 367.6 km^2. The district is situated on the border of two countries. The boundaries of the district are formed to the south by the Danube and in the south-west by the Morava River, which are also the borders between Slovakia and Austria. In the urban area the boroughs of Petržalka, Jarovce, Rusovce and Čunovo form the border with Hungary. In the east, the district shares a boundary with Senec district, in the north-east with Pezinok district and in the north with Malacky district. From the point of view of local government divisions, the city is divided into seventeen boroughs.

The northern part of the district is rugged, formed by the western part of the Small Carpathians, divided from the north to the south by the Lamač Gate. The highest point is at Devínska Kobyla with an altitude of 514 metres above sea level. There are the highlands of Kráľova Hora and the Jesuit forests, as well as

Devínska Kobyla, between the borough of Karlova Ves and the borough of Devín. In the southwest, the Za Blatom mountain range is located in the borough of Devínska Nová Ves, and Dúbravská Hlavica and the Švábsky Vrch hill are located above the borough of Dubravka. The western foothills of the Small Carpathians are located above the boroughs of Lamač and Záhorská Bystrica. The southern slopes of the Small Carpathians are the winegrowing area of the district, with the vineyards planted up to an altitude of approximately 300 m. The Danube lowlands are represented by the Danube Plain, which occupies a wide area along the River Danube. Morphologically, as a result of its steady descent, it is a flat young plain, divided only by oxbow lakes and flowing channels, meanders and canals. As a neogeneous basin on a deep crystalline core, it is filled with ungrained sediments of Neogene (Pleistocene clays, sands and gravels) that are covered by various coarse Quaternary sediments (Pleistocene loess and loess loams and Holocene alluvial and proluvial sediments). There are no major differences in the geomorphological values of the Danube Plain rocks (Ministerstvo vnútra SR 2019). The Bratislava Region is significant for a number of unique natural areas (Table 1).

Table 1. Protected areas in Bratislava region (Protected area – PA, Nature reserve – NR, Natural monument – NM, National natural monument – NNM, National nature reserve – NNR, Protected landscape element – PLE, Protected bird area – PBA, Area of European Importance AWI, Wetlands of International Importance WII (Ministerstvo vnútra SR 2019)

Title	Category	Area [m^2]	Title	Category	Area [m^2]	Title	Category
Pine wood	PA	8 012	Kopáčsky island	NR	826200	Sysľovské polia	PBA
Bôrik	PA	14 284	Topoľové hony	NR	600600	Danube floodplain	PBA
Horský park	PA	229 615	Fialková valley	NR	205879	Záhorské Pomoravie	PBA
Green space by waterworks	PA	2 348	Slovanský island	NR	343772	Devínske lake	AEI
Bajdeľ	PA	86 800	Štokeravská vápenka	NR	127085	River Morava	AEI

Table 1. cd.

Title	Category	Area [m^2]	Title	Category	Area [m^2]	Title	Category
Poľovnícky forest	PA	75 000	Island meadows	NR	549300	Devínske floodplain	AEI
Devínske alúvium Moravy	PA	2 531 600	Starý háj	NR	766520	Devínske alluvium of the Morava	AEI
Lesné diely	PA	5 250	Danube islands	NR	2197100	Vydrica	AEI
Sihoť	PA	2 349 100	Panský diel	NM	156 000	Homolské Karpaty	AEI
Jarovská bažantica	PA	782 579	Rössler quarry	NM	23 828	Devínska Kobyla	AEI
Hrabiny	PA	70 500	Devínska forest steppe	NM	50 966	Bratislava floodplain	AEI
Chorvátske channel	PA	98 463	Devínska castle rock	NNM	17 000	Biskupické floodplain	AEI
Soví forest	PA	418 700	Devínska Kobyla	NNR	1 011 157	Island meadows	AEI
Pečniansky forest	PA	3 953 500	Vápenický stream	PLE	-	Devínske lake	WII
Gajc	NR	627200	Small Carpathians	PBA	-	Alluvium of the Morava	WII

The River Danube, especially after the water level was increased by the Gabčíkovo dam, directly affects all the surrounding areas of standing water. The most important lakes include Zlaté Piesky, Veľký Draždiak, Kuchajda, and Vajnory. Smaller lakes in the district are Štrkovec, Kalné, Malý Draždiak, Trávníky, Rusovské and Čunovské. These were created by gravel mining. Rye Island's groundwater is the largest reservoir of quality drinking water in Europe. Because it is protected, this area is declared a water management area.

Based on the demography of the Bratislava region, we can evaluate the threat of unusual phenomena, related to the weather and climate. Bratislava's relatively complex location is reflected in the specific characteristics of the city's climate and its surroundings. Particularly the Small Carpathians influence circulation and thereby all the other climatic characteristics. Tab. 2 shows extreme values in the monitored area.

Table 2. Historical extremes observed over the entire observation period in the district (Ministerstvo vnútra SR 2019)

Weather and climatic characteristics of Bratislava district in terms of possible emergencies				
Element / characteristics	Periodicity of 10 years	Periodicity of 50 years	Historical data	Date of occurrence
Wind				
maximum wind speed	34.5 m/s	39.2 m/s	40.0 m/s	4.8.1979
temperature extremes				
maximum air temperature	37.5 °C	39.2°C	39.4 °C	8.8.2013
minimum air temperature	-17.7 °C	-21.2°C	-24.7 °C	9.2.1956
thunderstorm and torrential rain				
average number of days with storms in year	21 days			
short-term torrential rain – 15 min	18.8 mm	23.2 mm	-	-
maximum daily total precipitation	55.0 mm	67.8 mm	86.4 mm	16.8.1951
snow cover				
maximum height of snow cover	46 cm	62 cm	71 cm	24.1.1987
air temperature inversion				
burden of the territory by inversion	Borská lowland Small Carpathians, Danube Plain, Danube Highlands	average inversion area		
		low to moderate inversion area		
		moderate inversion area		

3.2. Areas of potential flood risk

Hydrologically, the area is part of the basin of the Danube, the second largest European river. The Danube flows into the district at the Devín Gate and forms a natural border with Austria. On the boundaries of the boroughs of Karlova Ves and Petržalka it flows through the district and forms the boundary with the district of Bratislava V., within the region. South of the village of Hamuliakovo, the main flow of Danube forms the border with Hungary. The length of the river in the region is 29.8 km, the average width is 300 m and Q100 = 11000 m^3/s. In the districts of Bratislava V and Senec, it forms the Hrušov water reservoir as

part of the Gabčíkovo dam complex. Close to the Bratislava borough of Čunovo the Čunovo dam is built on the Danube. The Little Danube flows through the region for a length of 27.18 km, the average width of the river is 20 m and Q100 = 90 m^3/s. The Morava River flows through the region for 60 km from the village of Veľké Leváre, to its confluence with the Danube near Devín, forming the border with Austria. The width of the river ranges from 40 to 250 m, Q100 is 1400 m^3/s.

The risk of these rivers overflowing is likely with 100-year waters in the Bratislava boroughs of Devín and Devínska Nová Ves. The existing embankments the Danube provide sufficient protection in Bratislava itself. The existing system of protection is followed by the Gabčíkovo dam. From SNP Bridge (Slovakia) to Wolfsthal (Austria), a new embankment has been built, following on from the flood protection in Austria. The Morava River has no continuous flood protection in Bratislava. The area outside its course is relatively wide with considerable flow capacity (Ministerstvo vnútra SR 2019).

In terms of floods in Bratislava, the most dangerous rivers are the Danube and the Little Danube. There are 21 hydrological structures in Bratislava. The flows of the Bratislava region and the water structures situated on them are listed in Table 3.

Table 3. Hydrological structures in Bratislava region (Ministerstvo vnútra SR 2019)

Title	Water flow	Hydrological structure / Sedimentation	Type of structure
Danube embankment in Bratislava (Petržalka pumping station, closing structure and MVE Pálenisko), pumping station by Chorvátske channel	Danube	hydrological structure	protective embankment – earth, flood walls
GABČÍKOVO DAM	Danube	hydrological structure	system of hydrological structures
SLOVNAFT service station block 127	Danube	hydrological structure	pumping station
Mouth of Vydrica and Čierny stream	Danube	hydrological structure	flood protection line, shut-off structure with mobile pumping station
borough of Devín – Slovanské bank	Danube	hydrological structure	flood protection line
borough of Devín	Morava	hydrological structure	flood protection line

Table 3. cont.

Title	Water flow	Hydrological structure / Sedimentation	Type of structure
borough of Devínska Nová Ves	Morava	hydrological structure	flood protection line, closing structure with mobile pumping station
MCHB WWTP SLOVNAFT	Danube	hydrological structure	concrete tanks
Pálenisko – old (Little Danube – old)	Little Danube	hydrological structure	weir
Small reservoir at 2nd quarry	Vydrica	hydrological structure	Earth dam
Small reservoir at Pod Slivom	Constant flow of Vydrica	hydrological structure	earth dam
SLOVNAFT oil separator WWTP blocks 11 and 17-18	-	hydrological structure	oil separator
Small reservoir at Srnie	Vydrica	hydrological structure	earth dam
Železná studnička – pond no. 1, no.2, no.3, no.4	Vydrica	hydrological structure	earth dam
VN Koziarka	-	hydrological structure	earth dam
Polder on Pieskový stream I	Pieskový stream	hydrological structure	polder
Polder on Banský stream	Banský stream	hydrological structure	polder

3.3. Areas of potential fire and explosion hazard

Forest fires can break out in the Bratislava Forest Park (its area is 3100 ha, including parts of the boroughs of Staré Mesto, Nové Mesto, Karlova Ves, Lamač, Dúbravka, Devín, Devínska Nová Ves, Záhorská Bystrica, Rača and Vajnory), Devínska Kobyla and Lamač, Záhorská Bystrica, the alluvial forests, Pečniansky forest and the forest parks near the Veľký Draždiak and Malý Draždiak lakes, mainly due to human intervention and by exceptionally extreme weather conditions.

The Bratislava region is also exposed to potential risks with regard to fires and explosions in manufacturing plants resulting from the nature of their activities.

In terms of fire situations, the number of flammable substances stored by legal entities and natural persons in the chemical, engineering and food industries also influences the situation in Bratislava. See Table 4 for a list of important manufacturing plants where industrial fires may occur.

Table 4. List of important manufacturing companies (Ministerstvo vnútra SR 2019)

Title	Borough	Activity	Risk arising from the nature of the activity
Volkswagen Slovakia, a.s.	Devínska Nová Ves	Automotive manufacture	classified under Act 128/2015 into category "A"
SLOVNAFT, a.s.	Ružinov	chemical production	classified under Act 128/2015 into category into category "B"
Duslo, a.s., Bratislava	Nové Mesto	chemical production	classified under Act 128/2015 into category into category "B"
Rajo, a.s.	Ružinov	food production	leakage of hazardous substances
Mondeléz SR Production, a.s.	Nové Mesto	food production	leakage of hazardous substances
Prvá Bratislavská pekárenská, a.s.	Petržalka	food production	none
Slovakian Door Company (SDC), s.r.o.	Devínska Nová Ves	development and manufacture of spare parts for cars	none

4. Results, discussion and conclusions

From the point of view of the effects of possible emergencies in the district of Bratislava, the most likely situations are natural disasters (floods, hailstorms, storms, landslides, ice) and accidents (fires, explosions and releases of dangerous substances). The most likely situations can be considered to be natural disasters (Table 5), which arise after cloudbursts and subsequent torrential rains, overflowing watercourses, the rise of groundwater and consequent flooding of nearby houses and adjacent agricultural and forest areas, thereby endangering the life and health of the population, domesticated and wild animals, deterioration of agricultural production, pollution of sources of drinking water, flooding of roads and outages of sources of electrical power that are close to watercourses.

Table 5. Analysis of expected consequences by individual source of risk (Ministerstvo vnútra SR 2019)

Endangered borough	Risk Source / Threat	Crisis Phenomena 1	Crisis Phenomena 2	Crisis Phenomena 3
Ružinov	Transpetrol, a.s.	Leakage of hazardous chemicals	Explosions	Fire
	Bratislava Airport			
Ružinov	Bratislava Airport	Viruses	Bacterial infectious disease	
Devínska Nová Ves	Volkswagen Slovakia, a.s.	Leakage of hazardous chemicals	Explosions	
Vajnory	Linde Gas k.s.			
Nové Mesto	Duslo, a.s.			
Ružinov	Slovnaft, a.s.,			
Ružinov	Rajo, a.s.			
Ružinov	Ružinov sports club V. Dzurilla Arena			
Nové Mesto	STaRZ O. Nepela Arena			
Dúbravka	STaRZ, Harmincova 2 Arena			
Ružinov	Ice-Berg Slovakia, s.r.o.			
Ružinov	Messer Tatragas, s.r.o., o.s.			
Nové Mesto	Mondeléz SR Production, s.r.o.,			
Podunajské Biskupice	Probugas, a.s.			
Podunajské Biskupice	River Danube	Flood	Insect swarms	-
Devín	River Danube			
Karlova Ves	River Danube			
Petržalka	River Danube j			
Staré Mesto	River Danube			

Table 5. cont.

Endangered borough	Risk Source / Threat	Crisis Phenomena 1	Crisis Phenomena 2	Crisis Phenomena 3
Staré Mesto	Pine wood, Bôrik, Horský park, green space by waterworks	Fire	Forest fires	Destruction of soil and plant cover
Podunajské Biskupice	Bajdeľ, Polovnícky forest, Gajc, Kopáčský island, Topoľové hony			
Nové Mesto	Rossler quarry			
Devín	Devín alluvium of the Morava			
Karlova	Sihoť			
Devín	Fialkova valley, Slovanský island			
Petržalka	Hrabiny, Soví forest, Starý háj			
Karlova Ves	Pečniansky les			
Jarovce	Jarovská Bažantica			
Rusovce	Danube islands			
Čunovo	Island meadows			

Assessment of possible threats to Bratislava from the following emergencies:

1) Flooding of the River Danube – endangered boroughs – Podunajské Biskupice, Devín, Karlova Ves, Petržalka, Staré Mesto
2) Flooding of the River Morava – endangered boroughs – Devínska Nová Ves,
3) Threats from forest fires in the Small Carpathians, Bratislava Forest Park, Devínska Kobyla, Lamač and Záhorská Bystrica, floodplain forests, Pečniansky forest and the forest park near the Veľký Draždiak and Malý Draždiak lakes
4) Threat to residents from leakage of dangerous substances in road and rail transport
5) threats to residents from leakage of hazardous substances from static sources: Rajo, a.s., V. Dzurilla Arena, Harmincova Arena, O. Nepela Arena, ICE-BERG, s.r.o., Messer Tatragas, s.r.o., Mondeléz SR Production, s.r.o., Probugas, a. s., Transpetrol, a. s., M.R. Stefanik Airport Bratislava, a.s. (BTS), Volkswagen Slovakia a.s., Linde Gas k.s., Duslo, a. s., Bratislava, SLOVNAFT, a.s.
6) threat of misuse of biological or chemical agents in terrorist attacks. Within the territory of the district there are numerous shopping centres, where a large number of inhabitants circulate throughout the day. Table 6 shows places where a large number of people congregate and thus become a weak point in terms of counter-terrorism security.

Table 6. Overview of buildings and places with a large number of people (Ministerstvo vnútra SR 2019)

Title	Boroughs	Maximum accumulation of persons
Bratislava Main Railway Station	Staré Mesto	10 000
Slovak Lines, a.s.	Ružinov	700
Slovak National Theatre new building	Staré Mesto	2000
Slovak National Theatre historic building	Staré Mesto	500
Nová Scéna Theatre	Staré Mesto	854
ASTORKA Korzo 90 Theatre	Staré Mesto	187
Aréna Theatre	Petržalka	264
LUDUS Theatre	Staré Mesto	175
Slovak Philharmonic	Staré Mesto	1000
Joint property fund of the confederation of trades unions in the Slovak Republic (Istropolis, Trnavské mýto)	Staré Mesto	1690
Cultus Ružinov, a.s.	Ružinov	740
STARZ hl. m. SR Bratislava	Nové Mesto	9942
STARZ hl. m. SR Bratislava	Nové Mesto	426
Ružinov sports club	Ružinov	3215
Inter – SC, spol. s. r. o. (Hant Arena)	Nové Mesto	4609
National Tennis Centre	Nové Mesto	4081
Incheba, a.s.	Petržalka	5455
Bratislava Airport (BTS)	Ružinov	2417
Tesco Stores SR, a.s. OD MY Bratislava	Staré Mesto	889
Tesco Stores SR, a.s. Petržalka	Petržalka	350
Tesco Stores SR, a.s. HM Lamač	Lamač	550
CBRE, s.r.o. (Polus City Center)	Nové Mesto	2530
Aupark, a.s.	Petržalka	7890
Ikea Bratislava, s.r.o.	Ružinov	1750
Ikea Centres Slovenska, s.r.o.	Ružinov	3642
Eurovea, a.s.	Staré Mesto	6934
Centrál shopping centre	Ružinov	-
Bory Mall – shopping centre	Lamač	2810

4.1. Recommendations for developing population protection plans

Prepare a population protection plan under section 3c of Act no. 42/1994 on Civil Protection of the Population, as amended, including anti-radiation, anti-chemical and anti-biological measures. Particular attention should be paid to the following individual measures:

- Monitoring of the area,
- Warning the population and notifying people,
- Evacuation,
- Regulation of the movement of persons and means of transport,
- Pre-medical first aid and emergency medical care,
- Removal of leaks of hazardous substances and prevention of their uncontrolled spread,
- Banning and regulating the consumption of contaminated food, water and feed,
- Measures to ensure rescue work.

4.2. Recommendations to prevent the spreading and consequences of an emergency

The planning of rescue work is based on the worst-case scenario of the emergency, while the most important measure to protect the population is warning the population and possible evacuation. Special attention should be paid to the following measures:

- Checking measures around hydrological structures and watercourses,
- Performing checks on legal persons and natural persons – entrepreneurs who manufacture, store and handle hazardous substances,
- Preparation of directing organizations, forces and means of carrying out rescue work,
- Preparing the population for self-protection and mutual assistance in the event of an emergency,
- Mutual cooperation between emergency units in preparation for emergencies,
- Exchange of experience and knowledge with neighbouring districts.

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Abstract

The paper focuses on emergencies in a particular region of the Slovak Republic. The focus is mainly on describing the emergencies to which the region is most vulnerable and classifying them, as well as specific locations or businesses where there is a high risk of an emergency occurring. From the point of view of the effects of possible emergencies on the district of Bratislava, the most likely situations are natural disasters (floods from

precipitation and watercourses, hailstorms, storms, landslides, ice) and accidents (fires, explosions and releases of dangerous substances). When planning rescue work, it is necessary to start from the worst-case scenario of the emergency, while the most important measure to protect the population is issuing warnings and possible evacuation. Special attention should be paid to the following measures: checking the safety measures around hydrological structures and watercourses, carrying out checks on legal entities and natural persons – entrepreneurs who manufacture, store and handle hazardous substances, preparing controlling organizations, forces and resources to carry out rescue work, preparing the population for self-protection and mutual assistance in the event of emergencies, mutual cooperation of rescue teams in preparation for emergencies, exchange of experience and knowledge with neighbouring districts.

Keywords:
floods from precipitation and watercourses, natural disasters, landslides,
slope movements, earthquakes, volcanic eruptions, natural fires