

## HISTORICAL PERSPECTIVE ON THE DEVELOPMENT OF THE CONCEPT OF RESILIENCE

ELIŠKA KRISTLOVÁ – LENKA MALÉŘOVÁ – MAREK SMETANA – HANA ŠTVERKOVÁ – JANA WOJNAROVÁ

**Abstract:** *Based on ever-increasing incidence of events that concern not only Europe, but also the Czech Republic, is needed to address prevention, respectively respond to these situations adequately. Since the beginning of human society, people are faced with various sides in the nature (in the past have been associated with punishment for transgressions and bad deeds), and the dangers of the outside world, that undermine the peaceful life of the population. Population over time, and the evolution of these events began to realize the need to learn how to prepare and cope not only with other events, but also with its consequences. To this day was the countless proposals and concepts, how the population should deal with these large events. One of them may well be the concept of resilience. The aim of the paper is to point out the increase in the incidence of events for a specified period and present the historical development of the word resilience.*

**Keywords:** *Adverse event, extraordinary events, resilience, population.*

**JEL Classification:** Q57

### 1. INTRODUCTION

Population has the right to a healthy and safe life and adequate protection of their property; this right is written in the Constitutional Act No. 2/1993 Coll [1], Charter of fundamental rights and freedoms. But, in a normal life, there are many unexpected situations and adverse event when this right can be disrupted and may result into immediate danger to the lives and health of the population, damage of property and the environment. An adverse event can be understood any event (flood, earthquake, landslide, etc.), that time and scope can escalate into a crisis situation and it is necessary to declare an emergency status. In the Czech Republic is such a situation called an extraordinary event, according to Act No. 239/2000 Coll. about the Integrated Rescue System [2].

Population is trying to ensure safety against these negative consequences caused by these events. Most people's perception of the safety of subjectively, because they are more concerned with the obstacles of their everyday life than the fears of extraordinary events. And it is precisely the task of all the authorities of state administration and territorial autonomy, across vertical structures and across departments, to respond appropriately to mitigate the effects of these various negative phenomena.

A person or system isn't perfect enough not to be affected by the extraordinary event. It may be the consequences caused by the floods, terrorist attacks, or the occurrence of epidemics, economic crisis, or traffic accidents. Since the beginning of human community, people have been struggling with these events that threaten them. In the times of prehistory and the Middle ages communities were threatened the fires, floods, earthquakes, and other events caused mostly by natural forces. But with technical progress, community has been threatened by other events. These events can be caused by a human factor (oblivion, rush, ignorance), or it can be a outcome of unfortunate accidents. Among the important examples of historical events can be remembered mass traffic accident (March 24, 1990, a fire in the Mont Blanc tunnel, a total of 35 dead) [3], leaks of dangerous substances (June 10, 1976, leak of dioxin in the

Italian chemical plant in Seveso, severe poisoning of about 200 people, about 605 people had serious consequences) [4] or the terrorist attacks (May 25, 2017, concert in Manchester in England, 22 dead and about 60 injured) [5].

Nowadays, it is therefore necessary to state, community, society, or individual to be able to adapt and cope with the consequences caused by these extraordinary events. The population should be able to defend these threats or eliminate the consequences of the extent of loss of life, health, and property of the inhabitants. People must obtain basic information and learn over time how to recognize the origin of the extraordinary events and how to response it. The importance of this issue can be seen in the following statistics of extraordinary events.

### 2. STATISTICS OF EXTRAORDINARY EVENTS

Registration statistics tracking extraordinary events is a very important prerequisite for prevention and preparedness of the state, community, society, or individual for future events. The reason for dealing with the issue of the safety of population is a continuous increase of the consequences caused by exceptional occurrences, just when they are at risk the lives and health of the population, or the consequences of these events can cause death.

Information about the occurrence of extraordinary events several decades back can be found in different databases. This fact is verified based on data obtained from the international Emergency Events Database (next in article EM-DAT). EM-DAT is global database contains data on the occurrence and effects of over 22,000 mass disasters in the world from 1900 to the present day. The database is compiled from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies [6, 7].

Due to this fact, the collection of information about extraordinary events, the data are suitable for various statistical studies, or can also be used as input parameters for the analysis of risks in the territory or in the company (geography, date of origin, economic damage, and

information about the number of people injured and killed in various extraordinary events) [6].

This database classifies events on natural and technological extraordinary events. Natural events being divided into six sub-groups: biological, geophysical, climatological, hydrological, meteorological, and extraterrestrial disasters. Technological events divided into industrial, transport and miscellaneous events, the database only includes disasters that were unintentional (excludes acts of war, terrorism, or sabotage) [6, 7]. A graphical representation of the classification of the extraordinary events is in the Figure 1 and Figure 2.

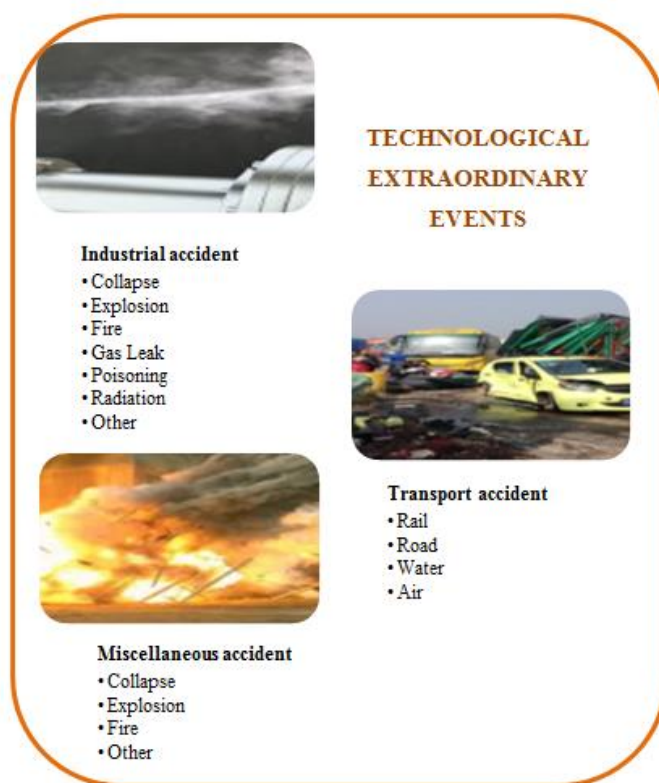
The total number of extraordinary events (natural and technological) that have taken place on the territory of the European States in the years 2000 through 2016, it is possible to see on Figure 3 these data being sorted according to the frequency of occurrence in the given country over the selected period. Over 900 extraordinary events were recorded - the most events during this time were threatened

by Russia (94) [6]. Figure 3 also presents more detailed statistics for the Czech Republic. The Czech Republic was affected by 20 extraordinary events during the period 2000 - 2010 [6]. Most of the population is endangered by floods, storms and high temperatures which can cause drought. Further on the territory of the Czech Republic were caused two serious traffic accidents, which were also registered in history as the most tragic events (2003 - road traffic accident at E55, 20 people died and 34 were seriously injured [8], 2008 - railway accident in "Studénka", 8 people died, 95 were injured [9]).

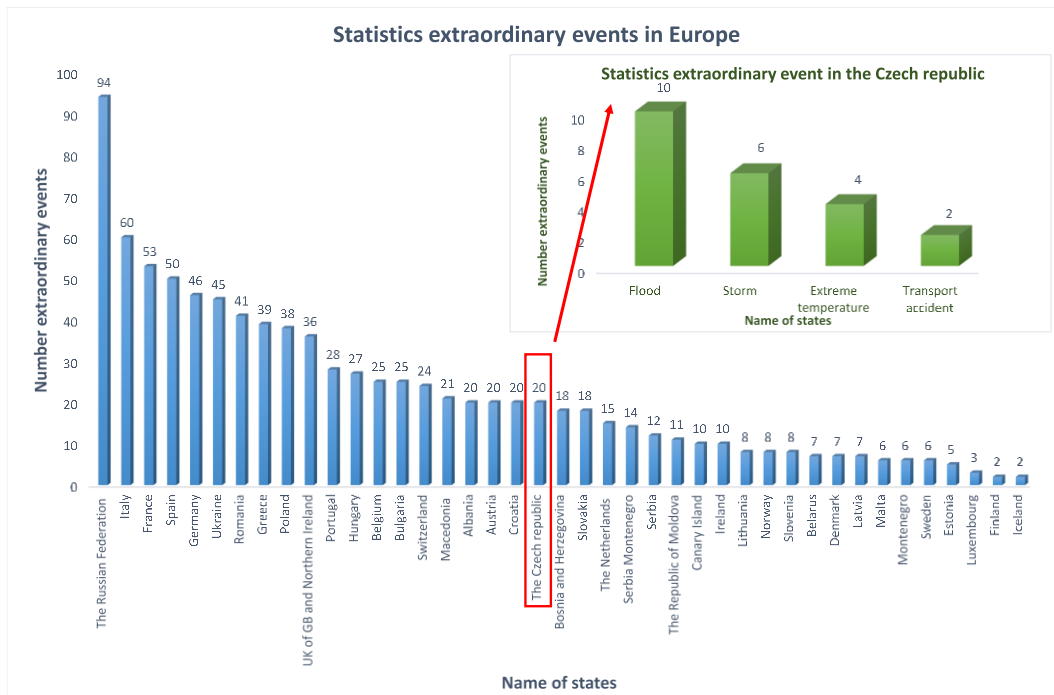
Figure 4 shows the number of individual extraordinary events for the selected period (2000-2016). Most of Europe is threatened by the floods, the second in the order are traffic accidents, and in third place are the storms. In contrast, only one was for this period infestation of insects (locust) and the one impact of the meteorite. Both events have happened in Russia.



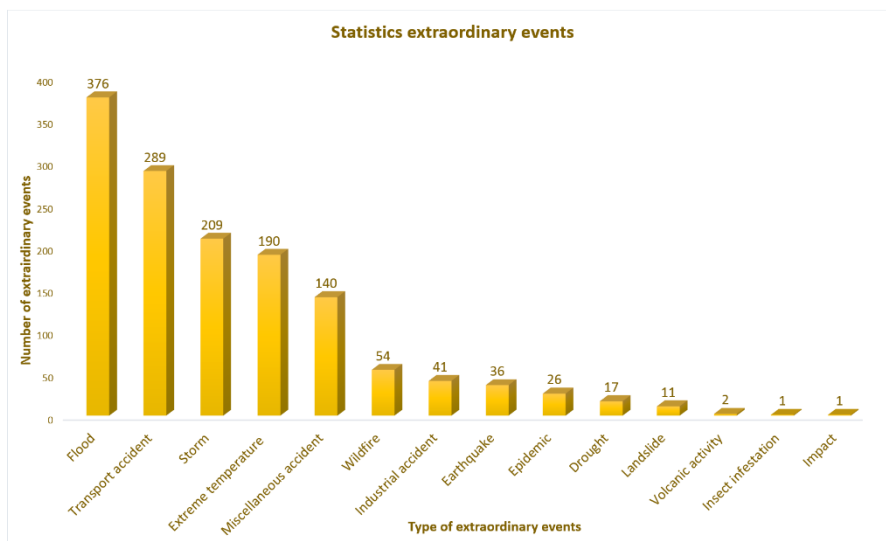
**Figure 1** Classification natural extraordinary events (EMDAT)  
 Source: own processing



**Figure 2** Technological natural extraordinary events (EMDAT)  
 Source: own processing



**Figure 3** Statistics extraordinary event in Europe (2000-2016) [6]



**Figure 4** Statistics extraordinary event in Europe (2000-2016) [6]

Table 1 shows the number of injuries and the number of deaths for the 2000-2016 periods for each type of extraordinary events. As you can see the most fatalities (142 665) is attributed to the effects of extreme temperatures, but the most affected victims (6,608,030) are consequence of the floods - the most frequent occurrence of extraordinary events in Europe. (Figure 4)

Table 2 shows the total damage caused by individual extraordinary events. Most are estimated damages in the floods and on the basis of the greatest frequency (Figure 4) of the occurrence of the period considered. Conversely, no damage was recorded for epidemics and insects infestation.

Based on these statistical investigations of incidents occurring in Europe between 2000 and 2016, it can be assumed that these events will become more frequent (due to climate change) and the consequences may be more

serious. And this is the reason why it's needed to address in more detail concept of resilience.

### 3. HISTORY OF THE WORD RESILIENCE IN THE WORLD AND IN THE CZECH REPUBLIC

Few researchers know about the long and significant history of the term resilience, and this affects to the use in today's modern context. Some people think that this concept originated in recent times, some of them guess that it was originated at the turn of the 18th and 19th century. In fact, the word has this term much deeper roots in history, the aim of this part of the article is to clarify the basic question of the origin and the way the word itself is used [10].

**Table 1** Total number of injured and dead during extraordinary events in Europe (2000-2016) [6]

Type of extraordinary events	Total deaths	Total affected
Extreme temperature	142 665	653 918
Transport accident	8 586	6 513
Miscellaneous accident	3 099	49 822
Flood	1 747	6 608 030
Earthquake	685	299 707
Storm	644	3 812 967
Wildfire	305	1 177 738
Landslide	204	2 852
Industrial accident	28	8 137
Epidemic	19	17 170
Drought	2	1 278 769
Impact	0	301 491
Insect infestation	0	0
Volcanic activity	0	0
<b>Total</b>	<b>157 984 deaths</b>	<b>14 217 114 injured</b>

**Table 2** The total amount of damages caused by extraordinary events in dollars and euros in Europe (2000-2016) [6]

Type of extraordinary events	Total amount (USD)	Total amount (EUR)
Flood	98 868 967 \$	84 884 841 €
Storm	48 189 800 \$	41 373 786 €
Earthquake	27 120 132 \$	23 284 233 €
Extreme temperature	14 411 051 \$	12 372 738 €
Miscellaneous accident	11 636 407 \$	9 990 542 €
Wildfire	10 132 187 \$	8 699 080 €
Drought	8 617 709 \$	7 398 812 €
Industrial accident	970 000 \$	832 802 €
Landslide	510 000 \$	437 865 €
Transport accident	138 000 \$	118 481 €
Impact	33 000 \$	33 000 €
Volcanic activity	3 100 \$	2 662 €
Epidemic	0 \$	0 €
Insect infestation	0 \$	0 €
<b>Total</b>	<b>220 630 353 \$</b>	<b>256 932 417 €</b>

Generally is accepted, that the term resilience comes from the Latin terms “resilio” and “resiliere” [10, 11, 12, 13, 14, 15]. Purpose of these words can mean "spring back, bounce back or recoil ". A demonstrative example is a simple spring. It deforms with force. As soon as the force stops to act on the spring, spring trying to get to original state. Much later, the term passed into Middle French “résiler” [10], in which it came to mean “to retract” or “to cancel”, and then it migrated across the Channel La Manche into English as the verb “resile” [10]. Here, it was used again in the sense of “retract”, “return to a former position” or “desist”. At the beginning of the 19th century (approximately 1818), resilience began to appear in the field of mechanics, where it characterize just the behavior of the spring. In the middle of the 19th century [12, 14, 15] it appeared in ecology (approximately 1973) of the effort to describe the adaptation of changing environmental conditions [12, 15] , and in psychology (approximately 1971). In those branches, it was taken as the ability of an individual to maintain, restore or

improve their mental health after serious life events [12, 15, 16]. During this time, countless attempts have been made to develop definitions that have attempted to characterize the concept of resilience for various areas of science and research, e.g. in connection with natural disasters or extraordinary events, such as the ability to receive and recover from an extraordinary event [10, 14]. According to UNISDR, resilience is understood as: „The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management [17].“ Another example of the definition of resilience is the National Oceanic and Atmospheric Administration (NOAA). This organization understands resilience as a situation where a major event or a disaster causes damage and consequences, and it is necessary to "bounce from the bottom" and "take a step back" and return to the original or even better situation

(learn from this situation) than it was before [18]. A graphic representation of the development of this situation is in Figure 5.



**Figure 5** Understanding resilience according to NOAA [18]

Following part of the article will describe selected definitions for a correct understanding of the concept of resilience related to a given science discipline. (Figure 6).



**Figure 6** Selected definitions for different disciplines based on the correct understanding of the concept of resilience – own processing [10], [11], [12], [13], [14], [15]

As can be seen from the table and other definitions, there are different ways to explaining one term. Although nowadays term of resilience adapted to the different science discipline, there is no single general definition, which would be applicable to all these disciplines.

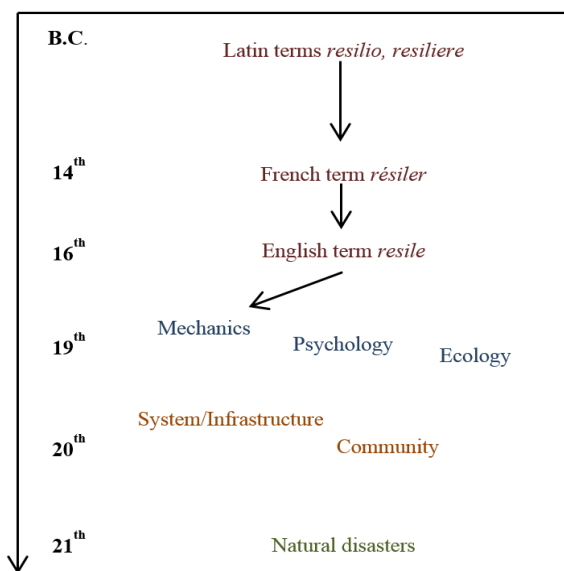
In the Czech lands, this term first appeared in the second half of the 20th century, at the time of Czechoslovakia. According to the information available [12], the term is understood as the flexibility. The reason for use instead the „resilience“ the word „flexibility“, was based on the time and situation that prevailed in Czechoslovakia. This term expressed the ability survives any attack, to resist the situations with possibility of breaking the social structure, and resiliently return to its functional state before the attack. Nowadays, resilience is seen more as a system / infrastructure resilience [12], than the reaction of a given system/infrastructure to the occurrence of an undesirable event.

#### 4. CONCLUSION

Nowadays, the concept of resilience is increasingly becoming interesting, due to the growing incidents. At the beginning of the articles, was presented statistics on the growing extraordinary events, not only in the Czech Republic, but also in Europe. The most threatened country in Europe seems Russia, with a total of 94 extraordinary events in 2000-2016. Compared to that Finland and Iceland had two seriously incidents only, in the same period. The most of dead, for this whole period, was entailed with high temperatures, when more than 140 000 people died and 650 000 people were injured. The floods causing a lot of injuries are also extraordinary events with very frequent occurrence too. During monitored period it caused nearly 2000 deaths. In addition, was made the statistics for the Czech Republic, where it has been found that this territory is the most threatened by floods, storms, high temperature, that can cause drought, and recently by seriously traffic accidents.

The next part of the articles deals with the concept of resilience itself. Figure 7 is a schema of the evolution of the term “resilience”. The English word "resilience" is taken from the French “résiler”, which is based on the Latin expression "bounce back" or "spring back". Resilience was first used in 19th century in the natural sciences (mechanics), later also in ecology and psychology, and understood as a reaction to an

adverse event. In the 20th century resilience has been exploited to the other disciplines too (e.g. infrastructure and system). Finally, from the beginning of 21st century is this concept closely associated with natural events and adaptation to climate change too.



**Figure 7** Schema of the evolution of the term “resilience” - own processing [10], [11], [12], [13], [14], [15]

On the contrary, in the days of Czechoslovakia, resilience in Czech Republic was understood flexibility, unlike today, when it is understood as the resistance of a selected system or infrastructure.

This article tried to describe the concept of resilience, from its inception to the present time. Resilience don't mean resistance to adverse events, but rather the ability to deal with these negative facts.

#### ACKNOWLEDGEMENT

The article was prepared as part of the project of the Student Grant Competition "The proposal (the creation of) the categorization of resources enabling the management of extraordinary events related to the community". Project number SP2017/140.

#### REFERENCES

- [1] Ústavní zákon č. 2/1993 Sb., ve znění ústavního zákona č. 162/1998 Sb., listina základních práv a svobod
- [2] Zákon č. 239 ze dne 28. června 2000 o integrovaném záchranném systému a o změně některých zákonů, ve znění pozdějších předpisů.
- [3] Mont Blanc Tunnel, Italy, [cit.27.07.2017] <http://www.mace.manchester.ac.uk/project/research/structures/strucfire/CaseStudy/HistoricFires/InfrastructuralFires/mont.htm>
- [4] 4 Seveso: A paradoxical classic disaster, [cit.27.07.2017] <http://archive.unu.edu/unupress/unupbooks/uu21le/uu21le09.htm>
- [5] 22 dead after blast at Ariana Grande concert in Manchester, [cit.27.07.2017] <http://edition.cnn.com/2017/05/22/europe/manchester-arena-incident/index.html>
- [6] EM-DAT: The International Disaster Database [online]. 1988 [cit. 2016-02-23]. Dostupné z: <http://www.emdat.be/>
- [7] Annual Disaster Statistical Review 2015: The numbers and trends [online]. [cit. 2017-07-27]. Dostupné z: [http://www.cred.be/sites/default/files/ADSR\\_2015.pdf](http://www.cred.be/sites/default/files/ADSR_2015.pdf)
- [8] Nejtragičtější silniční dopravní nehody na území samostatné ČR, [cit.27.07.2017] <https://www.elogistika.info/nejtragictejsi-silnicni-dopravni-nehody-na-uzemi-samostatne-cr/>
- [9] Vznik mimořádné události, [cit.27.07.2017] <http://www.hzscr.cz/clanek/casopis-112-rocnik-vii-cislo-9-2008-691727.aspx?q=Y2hudW09NA%3D%3D>
- [10] Alexander, D. E.: 2013. *Resilience and disaster risk reduction: an etymological journey*, Nat. Hazards Earth Syst. Sci., 13, 2707-2716, <https://doi.org/10.5194/nhess-13-2707-2013>.

- [11] PERNICA, Bohuslav a Luboš ČÍPA. 2016. *Koncept resilience společnosti a otázka jeho aplikace u států jako česká republika*. In: The science for population protection [online]. Lázně Bohdaneč: Lázně Bohdaneč : MV - generální ředitelství Hasičského záchranného sboru ČR, Institut ochrany obyvatelstva, s. 15 [cit. 2016-12-30]. ISSN 1803-568X. Dostupné z: <http://www.population-protection.eu/prilohy/casopis/32/239.pdf>
- [12] Definitions of community resilience: an analysis [online]. In: . Community & Regional Resilience Institute, 2013 [cit. 2016-12-30].
- [13] ŠTEFKOVÁ, Ivana a Martin DOLEJŠ. 2016. *Resilience u adolescentů v nízkoprahových zařízeních pro děti a mládež*. Olomouc. ISBN 978-80-244-4903-6.
- [14] PONDĚLÍČEK, Michael. 2013. *Přístup k resilienci a bezpečnosti ze současného úhlu pohledu*. In: The science for population protection [online]. Lázně Bohdaneč: Lázně Bohdaneč: MV - generální ředitelství Hasičského záchranného sboru ČR, Institut ochrany obyvatelstva, s. 9 [cit. 2016-12-30]. ISSN 1803-568X. Dostupné z: <http://www.population-protection.eu/prilohy/casopis/16/119.pdf>
- [15] The Evolution of the Resilience Concept; <https://mentalresilienceaustralia.com.au/2014/11/18/the-evolution-of-the-resilience-concept/> [cit.27.07.2017]
- [16] ŠOLCOVÁ, Iva. 2009. *Vývoj resilience v dětství a dospělosti*. Praha: Grada. Psyché (Grada). ISBN 978-80-247-2947-3.
- [17] UNISDR terminology on disaster risk. UNISDR terminology on disaster risk [online]. Geneva: United Nations International, 2009, s. 35 [cit. 2017-05-07]. Dostupné z: [http://www.unisdr.org/files/7817\\_UNISDRTerminologyEnglish.pdf](http://www.unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf)
- [18] NOAA announces \$9 million in grants to improve coastal community resilience. National Oceanic and Atmospheric Administration [online]. NOAA, 2015 [cit. 2017-05-07]. Dostupné z: <http://www.noaa.gov/noaa-announces-9-million-grants-improve-coastal-community-resilience-0>

**Ing. Eliška KRISTLOVÁ**

**Ing. Lenka MALÉŘOVÁ, Ph.D.**

**doc. Ing. Marek SMETANA, Ph.D.**

**Ing. Hana ŠTVERKOVÁ, Ph.D., MBA**

**Mgr. Jana WOJNAROVÁ**

VŠB – TU Ostrava, Fakulta bezpečnostního inženýrství

Lumírova 13, 700 30 Ostrava – Výškovice, Czech Republic