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Study on the Impacts of Emergency on Economic, Environmental and Social Areas Using Mixed Methods Research

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Abstract

Mixed methods research methodology appears to be a suitable approach for researching complex phenomena such as emergencies. Researchers study the impacts on different areas such as economy, society, or environment, mostly in separate studies. To better understand the reality of emergencies, it is necessary to study the problem in the broadest possible context. So, examining those impacts in one single study is a challenge. The objective of this article is to process a comprehensive assessment of an emergency that has the potential to establish the basis of a robust tool for public managers to support their decision-making, using mixed methods research methodology. The crisis is an explosion of an ammunition storage site in the Czech Republic - the former satellite country of the Soviet Union. The sub-methods used in mixed methods research are analysis of data, interviews, questionnaire surveys, and field research. The main findings include that in the economic area, growth of public budget expenditures was found; in the environmental area, primary and inducted impacts have been proved. Survey also confirms that the emergency reduced the personal sense of security and trust in public institutions in the affected community.

Keywords:

Emergency;
Public Administration;
Economy; Society;
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Mixed Methods Research.

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1- Introduction

Ensuring security is one of the essential functions of public administration that should provide to society. The security of society is public interest. Therefore, the European Union's (EU) member states central and local governments must prevent emergencies and reduce the security risk to a minimum. But how to perform in practice? Indeed by using proper decision-making tools. Therefore, the development of practical management tools to support decision-making and the creation of effective public policies is essential. The purpose of preventive and follow-up measures should be to choose a public policy that minimizes the impacts. Somers & Svara (2009) [1] even argue that professional local government managers must strive to identify, and be prepared for, all threats, regardless of the circumstances. However, emergencies are often unforeseeable, challenging to predict, and devastating in the magnitude of their consequences. The system must then be able to face such challenges and address them appropriately with suitable tools and processes.

As will be demonstrated in the next chapter, emergency research is a developing scientific discipline. Many qualitative and quantitative approaches and tools are used in its framework. However, research often focuses on parts of emergencies and their impacts, which may in some respect limit the usefulness of such studies. We argue that in addition to specifically a narrowly profiled analysis, emergencies should also be researched in the broader context, as many

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components of the system are often affected. In general, we can talk about economic, environmental, and social areas, which are also be considered three pillars of sustainable development. In the case of conducting research that will work in different ways with data from a number of areas, it is necessary to choose a suitable approach. In the initial design of this research, it was clear that different sub-methods and qualitative and quantitative approaches will be applied. The use of qualitative and quantitative methods in one study is typical for the mixed methods research (MMR) approach. We argue that comprehensive emergency studies have the potential to become a decision-making tool for public managers who, from the position of state or local government, must respond based on adequate information regarding Somers and Svara above. Creating a study that will comprehensively research the emergency is a challenge and also a benefit for theory and practice. On a theoretical level, it can be stated that this is an original approach to the issue, on a practical level, as mentioned, this type of study can be an effective tool to support decision-making. This article aims to compile a comprehensive analysis of the impact of an emergency in the EU country, the Czech Republic (CR) as a tool to support the decision-making of public managers. At the same time, we want to introduce and perform MMR as a suitable approach for the creation of such emergency studies.

The emergency occurred in 2014 and they were explosions of an ammunition storage site in the Zlín region - the Vrbětice (part of Vlachovice municipality) municipality. Although this issue currently resonates mainly at the media and political level, this study was performed before becoming a hot topic. It deals with the objective evaluation of the below-mentioned impacts without a political context. In general, the emergency resulted in losses of lives and property damage. Regarding the above, the study will focus on selected economic, environmental, and social impacts. In the case of economic impacts, the study deals with the costs of the selected stakeholders. The area of possible releases of pollutants into the air after explosions and also the possibility of induced environmental burden were chosen for the research of environmental impacts. In the case of the social field, we were interested in whether and how the emergency affected the community and its trust in public institutions. State authorities' investigation is currently ongoing into the incident, and at the same time, after almost six years, the site is being rehabilitated, and funds are being invested in containing the impacts. Regarding the suitability of the use of the MMR in research and evaluation of the impact of emergency, more specific related questions can be asked:

- What levels of public administration bore costs and in what amount?
- Did the emergency have an impact on the affected community?
- Did the emergency cause environmental impacts?

This article consists of six parts. In the introduction chapter, the content of the research and its context are presented. The challenges and benefits of research are also introduced. In the following chapter, a review of resources is performed, which defines the researched issues and at the same time proves the originality of our approach. The chapter, which deals with methodology and data, describes and specifies the MMR, including the specification of the use of the sub-methods. Interpretation is supported by a graphical representation of the workflow. The following is the research of three selected areas using qualitative and quantitative methods and presentation of the results, which are discussed in the following chapter. The final chapter summarizes the results of the study.

2- Theoretical Background

Human security is evident in the EU's efforts to increase security and stability at a state and regional level [2]. Europe and the world are currently dealing with a security threat of unprecedented proportions, the SARS-CoV-2 pandemic. However, it should not be overlooked that there is a whole spectrum of emergencies that affect the state's resilience and the region [3]. Mladan & Cvetkovic (2013) [4] divide emergencies into three frameworks - natural emergencies, situations related to human beings, and hybrid emergencies. Emergency preparedness is one of the fundamental challenges for the public administration, which has a state monopoly regarding public goods. However, there is an ongoing dispute among authors as to whether, or not, emergency intervention constitutes a pure public good, also due to the uncertainty as to whether it meets the non-rivalry and non-exclusion requirements to be classified as [5]. The fact that emergencies do not happen so often also brings with it some negatives such as a lack of experience in crises, difficulties in evaluating public programs and measuring performance in this area. There are pressures to document that the funds earmarked for emergency management have been used effectively [6]. At the same time, however, the official authorities are called to respond by taking emergency measures to mitigate the adverse effects [7]. But what is the cost of an emergency? Can it be objectively determined if losses of or harm to human lives occur? The impacts of an emergency can be unpredictable and can affect different areas. Somers & Svara (2009) [1] argue that city and county managers must consider the impact on the environment and the economy and the political community. An emergency also affects individuals and society. According to Walle & Turoff (2008) [8] emergency means an unknown situation that may trigger feelings of acute stress, anxiety, and insecurity. Based on the above sources, it can be said that an emergency denotes a relatively common and unknown situation that may affect economic, environmental, and social communities. The measures taken are then usually implemented by the public sector and financed using public funds.

Sources that have looked into emergencies and the impacts thereof examine this area from a variety of perspectives. Robinson et al. (2017) [9] dealt with the financing of emergencies in transnational settings. Their study analyses data to determine the factors that have influenced the allocation of funds to specific countries from the Central Emergency Response Fund of the United Nations. Waugh and Streib (2006) [10] discuss the wider emergency management system, arguing that having experienced a disaster may make the community more resilient should another emergency occur. Enander (2017) [11] addresses planning, at the national, community, and organizational levels. He argues that most emergency management plans have several things in common. Wu et al. (2014) [12] looked into modeling and simulations to support decision-making in the event of emergencies, presenting a decision-making system of emergency resources in their publication. It should be noted that some articles have recently been published on the impacts of the emergency triggered by the SARS-CoV-2 pandemic. Fezzi & Fanghella (2020) or Nowacki et al. (2020) [13, 14] address impacts on the economy in their studies. Caraka et al. (2020) [15] tackle the impacts on the economy and the environment, while Brian & Tang (2020) [16] address the implications the pandemic has on public policy and society. The security of the individual and society can also be regarded as a fundamental human need [17]. Another interesting paper, this time in the social field, is a study of communication between stakeholders in emergencies and its evaluation [18]. A publication on emergency planning of households and communities argues that preparedness is essential for better handling of corporate emergencies [19]. The social impact of an emergency in the context of an environmental disaster, namely an oil spill, was addressed already in 1992 by Rodin et al. (1992) [20]. The influence of social media and the use thereof by citizens during emergencies was the subject of research conducted by Kaufhof et al. (2018) [21]. The study concluded the use was chaotic, presenting the concept and evaluation of citizens' guidelines for using social media. In the domain of natural disasters, of which there are more than 400 per year, Trivedi & Singh (2017) [22] applied a "*hybrid group decision support approach to emergency shelter site selection problem*" as part of their earthquake case study. The authors also point to the complex implications of emergencies. Grebennik et al. (2019) [23], who worked on a strategy for planning and eliminating the consequences of emergencies, argued that the main goal of the emergency protection system is to reduce or prevent damage to human health, the economy, and the environment. Giddings et al. (2002) [24] point out the links and mutual dependence between the economy, the environment, and the social sphere.

Focusing on the use of MMR in crises is researched within studies dedicated to various topics in the field of health care [25, 26]. Exciting studies in this area were also published by Kennedy and Williams (2016) [27], who researched the application of MMR to inform health policy in Ghana. Hansen et al. (2016) [28] use MMR in the case of quantitative and qualitative components of mixed methods studies using specific examples from the Children's Safety Initiative-Emergency Medical Services, a large National Institutes of Health-funded research project conducted in the USA. Holtrop et al. (2016) [29] introduce using MMR in the case of health services research to examine the potential for innovations in MMR procedures and to illustrate these points through a project on care management that used a convergent mixed methods design. Gharaveis et al. (2019) [30] apply the mixed methods study to deliver empirical evidence on the influence of visibility on healthcare teamwork in Emergency Departments. Bakon & Millichamp (2017) [31] in the regional Australian hospital environment based on mixed methods, research the handover process and conclude that to deliver an optimal nursing handover from the emergency department to various wards, handovers should be structured and provide standardized content. The use of mixed methods in emergencies or crisis events is an approaching study by Norris and Prokopczyk (2018) [32]. It employs a mixed-method approach to analyze entrapment claims in terrorism cases. Wignell et al. (2017) [33] research changes in emphasis and style in the extremist magazines. They claim that although the magazines examined have changed, underlying world view, values, and ultimate aims remain consistent and unchanged. To explore the perceptions and diverse needs of community- dwelling medically vulnerable individuals in Israel using mixed methods to gain insights that could be used to promote future preparedness is the aim of the study by Shapira et al. (2019) [34].

The Human Security Index (Hastings, 2011) and Better Life Index (OECD, 2009) [35, 36] must be mentioned in the international context, reflecting the economic, environmental, and social dimensions. The Better Life Index (BLI) evaluates the quality of life in the total of 11 areas $BLI_m = \{BLI_1, BLI_{11}\}$, security of the society being one of them where BLI_8 represents civic participation and good governance and BLI_{10} is security. As for the CR, The Office of the Government of the Czech Republic drafted the Expert Group Final Report on the Identification of Relevant Quality-of-Life Indicators in the CR [37], which contains a new framework. The aim was to propose suitable indicators for measuring efforts to improve the quality of life in the field of security using the established criteria [38]. The Final Report mentions that, in general, the state should first and foremost develop efforts to ensure the assets a person needs to lead a high-quality life are protected. A set of quality of life protection QLP indicators were defined. A total of fourteen indicators $QLP_n = \{QLP_1, \ldots, QLP_{14}\}$ were proposed to assess the quality of life from the perspective of security. The objective indicators $\{QLP_1, \ldots, QLP_{10}\}$ are based on international databases, making it possible to draw transnational and interregional comparisons. As a rule, the indicators are evaluated on an annual basis. The subjective indicators $\{QLP_{11}, \ldots, QLP_{14}\}$ are based on public opinion polls and can therefore reflect the personal views of security as held by the population of the region concerned. One of the indicators the empirical research in this study will consider in the impact assessment exercise QLP_{12} will be the subjective feeling of security in the place of residence.

Emergency studies use different approaches, methods, and tools for research. The fact is that most of the research is focused on a specific part of the problem. There is a relatively robust base in the field of health and social issues within MMR and emergency research. To a limited extent, there is specific research that addresses the application of MMR in a broader context. Based on the resources, it can be stated that a more comprehensive investigation into the impacts of emergencies using MMR is a challenge. This article will focus on research using MMR in an original direction. Mixed methods will be used in the case of research into the economic, environmental, and social impacts of an emergency caused by an explosion as a public manager's tool to help them to evaluate the emergency. The choice of MMR will thus allow a comprehensive analysis of this crisis event.

3- Data, Methodology and Research Design

The choice of the scientific method should be motivated by the scientific research question [39]. Due to the complexity of the research, the MMR approach was opted for in this study. Suitable scientific methods needed to be applied to assess the emergency's economic, environmental, and social impacts. MMR involves applying more than one research method in a single study to find a better solution than would be the case with the application of only one research method. For all its undeniable advantages in the form of a more comprehensive understanding of the problem being researched, the approach also has its drawbacks, namely that it is costly and demands a lot of time and information [40, 41]. The choice of mixed methods research for this study was partially justified in the previous chapters, as well as the choice of researched areas. In addition to the fact they represent the traditional pillars of sustainability, the choice is supported by the fact that some emergency studies deal with the relations between the economy, the environment, and the social sphere as proved in the chapter above. However, not using MMR. The use of MMR for such research represents an optimal solution. In the case of this study, it is necessary to state as a basic assumption the nature of the researched problem concerning the availability, nature of the data, and their huge amount. Because this is a unique study of an ammunition storage explosion, which is a security risk, access to the data has been limited. It was possible to rely mainly on publicly available sources, which were supplemented by the results of a questionnaire survey in the affected community. Data collection and research thus encountered obstacles in some cases, even in the case of publicly available sources. E.g. in the economic area research, no data were provided in communication with the Zlín Regional Office.

In general, when defining and describing the emergency, we used documents and reports of the Ministry of the Interior of the Czech Republic and the Police of the Czech Republic. To collect data, we reached out to the following public administration institutions: Regional Police Directorate of the Zlín Region, Ministry of Defense of the Czech Republic, Ministry of Finance of the Czech Republic, Zlín Regional Office, General Directorate of the Fire and Rescue Services of the Czech Republic, Zlín Regional Hygiene Station, Zlín Emergency Medical Services, Ministry of the Interior of the Czech Republic, Police of the Czech Republic and the Vrbětice/Vlachovice municipality. The data were obtained by analyzing publicly available documents, e-mail communication with authorities, interviewing public sector and security community experts. Economic impacts are researched mainly regarding the processed data available from the Ministry of Finance of the Czech Republic, the General Directorate of the Fire and Rescue Services of the Czech Republic, and the Czech Republic's Police. Environmental data were obtained from publicly available resources of state administration bodies (especially Zlín Regional Hygiene Station). The data for research of the social area was based on two questionnaire surveys. The first questionnaire survey was conducted in the affected municipality in 2015. The second questionnaire survey was conducted by the research team in the affected municipality in 2020.

The limited availability of data further partially defined the sub-methods that were used within the MMR, including their specific applications. In general, it was a combination of qualitative and quantitative methods:

- Analysis and comparison of available data obtained from public sources,
- Quantification of environmental impacts based on air quality,
- Interviews with public sector and security community representatives,
- Questionnaire surveys, their evaluation, and comparison.

In the economic area, using the analysis of public finances for the years 2014 - 2019 it is researched, how much public money has been spent from the budgets of the selected actors. Given that public administration actors were involved in resolving the situation, we were interested in public finances. Depending on the structure of the Czech public administration, we came out of its formal hierarchy. We researched the impacts on state administration and local self-government. In the case of the state administration, we chose actors who were fundamentally involved and whose data were available. It is the central level of the state, the Fire and Rescue Service of the Czech Republic (FRSCR), and the Police of the Czech Republic (PCR). The financial impacts on the local self-government were researched at the regional and municipal levels.

In the environmental area, we logically considered two dimensions of impacts that have a demonstrable relationship to the emergency. The first are direct impacts, i.e. possible damage caused by the explosion, and indirect, induced impacts, which are related to the subsequent dealing with the emergency. In the case of direct impacts, data on selected air pollutants provided by the Zlín Regional Hygiene Station at different periods after the explosion and different measuring points were analyzed. These are pollutants measured by the Zlín Regional Hygiene Station and at the same time, these pollutants are important for setting measures in the case of the public sector. The publicly available reports of the Zlín Regional Hygiene Station were compared with the results of air quality measurements to analyze the environmental impacts. The conclusions drawn from the analysis are added to by the answers of the director of the occupational hygiene department of the Zlín Regional Hygienic Station to the questions asked. In the case of inducted impacts, regarding the available data and the nature of subsequent activities, the impacts caused by the involvement of the PCR fleet and the induced CO_2 emissions in the period 2014-2019 were selected. CO2 was chosen because it appropriately indicates the burden on the environment. CO_2 emissions correlate with the other pollutants in this case contained in the exhaust gases.

In the social area, there was almost no current data that could be drawn from public sources. The first questionnaire survey was conducted by the municipality of Vlachovice in 2015. The second questionnaire survey was conducted within this study in 2020 containing thirteen questions, which were used to determine the subjective views of security held by the inhabitants of Vlachovice after the ammunition storage site explosion in Vrbětice. The questionnaire was distributed to the inhabitants in writing in cooperation with the mayor of Vlachovice; it could also be filled out electronically ammunition storage site. To give the article greater authenticity and to discuss the results and add the context, a controlled interview was also conducted in March 2020 with the former Chief of the Military Intelligence Service of the Czech Republic and Security Adviser Gen. Ing. Andor Šándor (retired). The research design is summarized in Figure 1.

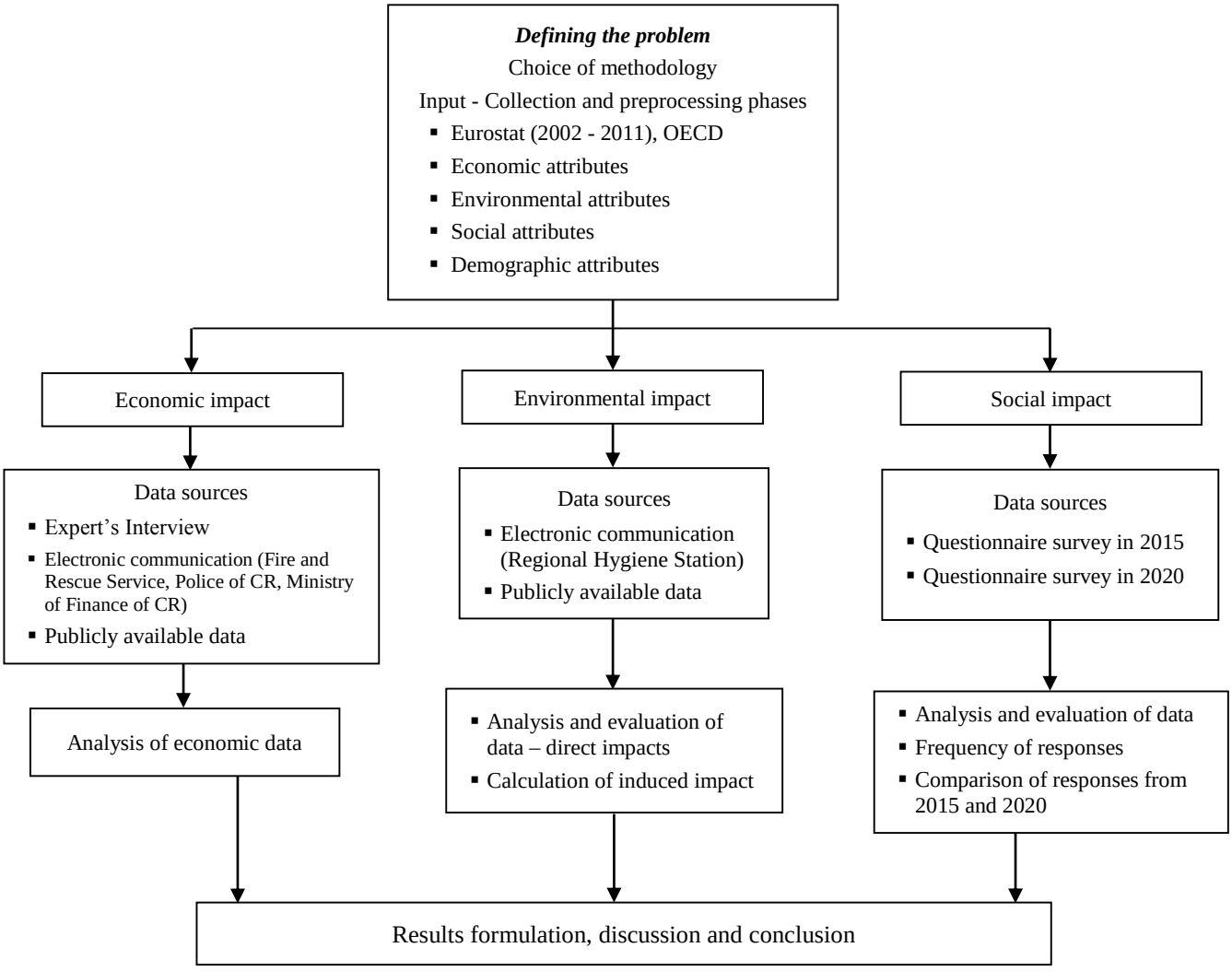

Figure 1. The research design

4- Research of the Impacts of the Emergency

For the special session of the Chamber of Deputies of the Parliament of the Czech Republic held on 12 December 2014, the Ministry of the Interior Summary Report on the Procedure in Dealing with Vrbětice ammunition Storage Site was drawn up [42]. The following information on the Vrbětice emergency corresponds to and is based on, the aforementioned report except for as indicated otherwise. On 16 October 2014, an explosion and subsequent fire occurred in the ammunition storage areas in Vlachovice, Zlín Region, CR. An extraordinary level of alarm was announced, which required the activation of all Integrated Rescue System (IRS) units, cooperation of the military police, and, later on, the Army of the Czech Republic. The explosion occurred in the ammunition storage site, which falls into the cadastral territories of a total of four towns: Vlachovice (surface area: 2,239 ha, population: 1,478), Bohuslavice nad Vláří (surface area: 686 ha, population: 376), Lipová (surface area: 1148 ha, population: 357) and Haluzice (surface area: 408 ha, population: 85) [43]. The site has been administered by Military Technical Institute, s.p., attached to the Ministry of Defense of the Czech Republic (MDCR), since 2007, which rented the site out to the private operations Bochemie, a.s. Real Trade, a.s., STV Group, a.s., Excalibur Army, s.r.o., Imex Group, s.r.o. As their line of business, these companies trade in military material, except for Bochemie a.s., which operates a recycling plant at the site, processing burnt rocket fuel [44]. The site, stretching over the length of approximately ten kilometers, included over 50 buildings, 27 of which contained ammunition weighing more than 1,000 tons. In total, there were up to 7,000 tons of material stored at the site. The explosion destroyed warehouse No. 16. The building belonged to Imex Group, s.r.o. The explosion damaged not only the buildings at the site but also properties in the neighboring towns. Two employees present at the site died at the time of the explosion during the emergency. Due to the nature of the material stored, the emergency created an unstable environment. As a result of the explosion, the ammunition was scattered around and outside the site, having been ejected to a distance of up to several kilometers from the epicenter of the explosion. Security measures were taken, including a) the site was closed within the perimeter of 1.2 kilometers from the epicenter of the explosion, b) this surrounding area was constantly guarded, c) the population was repeatedly evacuated, d) a telephone line was set up for the inhabitants, e) the incident was investigated, f) controlled disposal of the unstable ammunition. On 3 December 2014, warehouse No. 12 exploded. There were no casualties this time around. But the second explosion complicated the efforts at addressing the first emergency. The emergencies led to the remediation of the site, which will take up to several years while the ammunition at the site and in its surroundings is still taking place.

4-1- Economic Impacts of the Emergency

The economic impacts will be researched in terms of the effect on the public budgets of selected actors. These include the State, the FRSCR, the PCR as representatives of the state administration, the region, and the municipality as representatives of the local self-government. As regards the economic impact, we need to address the costs associated with: a) the explosion, b) deployment of IRS, c) assisting IRS. According to a decision passed by the Zlín Regional Office, the state contributed to the compensation provided to the affected people in the region [45] According to Šándor (2020) [46], the state, IRS, the region, and municipalities all contributed to the financing of the handling of the emergency.

State Level

The economic impacts will be assessed in terms of the funds provided from Chapter 398 - General Treasury Administration (VPA) of the State budget. Data for the analysis were obtained from the published final accounts [47-51] for 2014–2018. A total of CZK 213,354,000 was provided from Chapter 398 - VPA in 2014-2018 to cover the costs connected with the elimination of the consequences of the Vrbětice emergency. These funds were reassigned to chapters of the Ministry of the Interior of the Czech Republic (MICR), the Ministry of Defence of the Czech Republic (MDCR), and the budget of the Zlín Region. 42 % (CZK 88,675,000) was released from the special-purpose reserve emergency fund earmarked for addressing and preventing emergencies and eliminating the consequences thereof. About 33 % (CZK 71,098,000 Kč) was provided from the emergency reserve fund under Act No. 239/2000 Coll., on the IRS. 25% (CZK 53,581,000) was drawn down from the Government budget reserve fund. Table 1 shows the funds obtained from special-purpose reserve funds and Government budget reserve funds, which were released to the chapters of the relevant ministries and the regional budget (1 CZK to 0.045 USD).

Table 1. Funds from Chapter 398 - VPA in connection with the Vrbětice emergency reassigned to chapters and budgets in 2014–2018

Chapter/budget	Amount
Chapter 314 – MICR	139,526,000
Zlín Region budget	54,055,000
Chapter 307 – MDCR	19,773,000
Total	213,354,000

65% (CZK 139,526,000) was released to Chapter 314 - MICR. MICR is a central state administration body organizing the Integrated Rescue Services (PCR, HZSCR, Rescue Service) (IRS). The PCR and FRSCR units in particular were involved in the intervention. The funds were to be used by the Ministry, for example, to cover the policemen and firefighters' salaries, food, and fuel. 25% (CZK 54,055,000) of the funds obtained from the reserve funds were released to the budget of the Zlín Region. MDCR obtained 10 % (CZK 19,773,000) of those funds for its chapter to cover the costs associated, for example, with the mobilization of soldiers. Most funds from Chapter 398 - VPA were released in 2015 (approximately CZK 80,000,000), since 2016, a declining trend has been observed in the expenditures (in 2018, the expenditures did not even amount to CZK 20,000,000). Figure 2 shows the release of funds from the reserves of Chapter 398 - VPS in connection with Vrbětice emergency in 2014–2018. Data for 2019 were not available at the time of the research. The chart shows that most funds were released in the years 2015 - 2016.

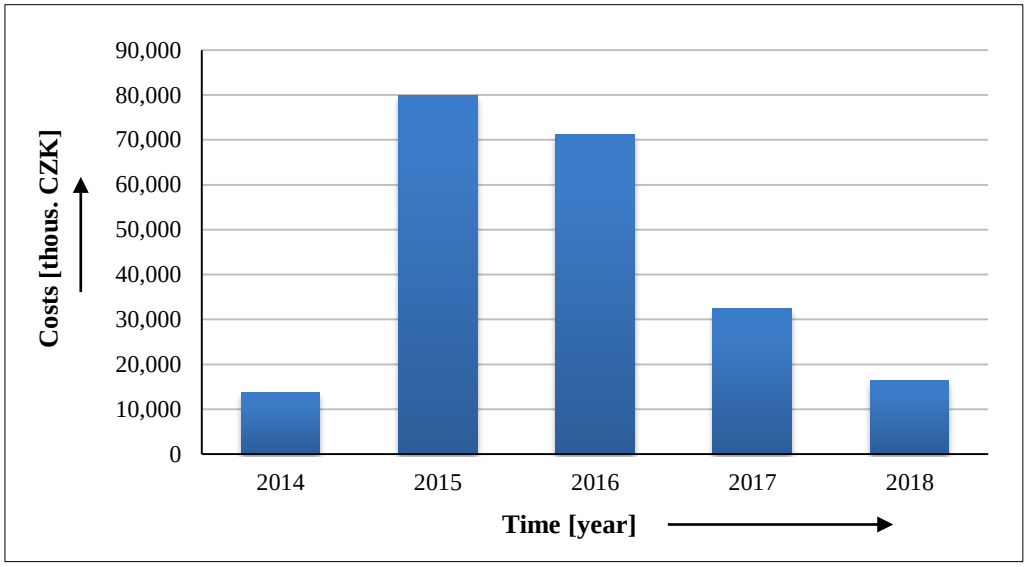

Figure 2. Release of funds from the reserves of Chapter 398 - VPS regarding Vrbětice emergency in 2014–2018

Expenditures on FRSCR and PCR

The Economics Section of the General Directorate of the FRSCR provided data on expenditures incurred by the FRSCR. In 2014–2019, expenditures in the total amount of CZK 52,052,000 were incurred. The expenditures were covered mainly from Chapter 398 - VPA of the State budget and the MICR budget. An overview of expenses is shown in Table 2 [52].

Table 2. FRSCR expenditures in connection with the Vrbětice emergency in 2014–2019 (in thousands of CZK)

Expenditure item	Amount		
	Budget MICR	Chapter VPA	Total
Other operating expenses	424,000	13,727,000	14,151,000
Wages and related expenses	5,858,000	2,369,000	8,227,000
Programme financing expenditure	0	29,674,000	29,674,000
Total	6,282,000	45,770,000	52,052,000

57% (CZK 29,6474,000) of FRSCR expenditures were earmarked for financing the programs. These are capital expenditures that were used, for example, to acquire lighting balloons, power generators, chainsaws, and rear containers. Operating expenses accounted for almost 27 % (CZK 14,151,000) of the expenditures, which were earmarked, for example, for the purchase of food, protective aids, small fixed assets, tools, tents. Almost 16 % (CZK 8,227,000) of expenditures were used to cover other operating expenses, such as wages and other related expenses [52]. As shown in Figure 3 from 2014 to 2016, there was a year-on-year increase in FRSCR expenditures every year in connection with the emergency. Most funds (more than CZK 20,000,000) were spent in 2016. Starting with the year after that, there has been a decrease in the funds spent (approximately CZK 2,500,000 in 2018).

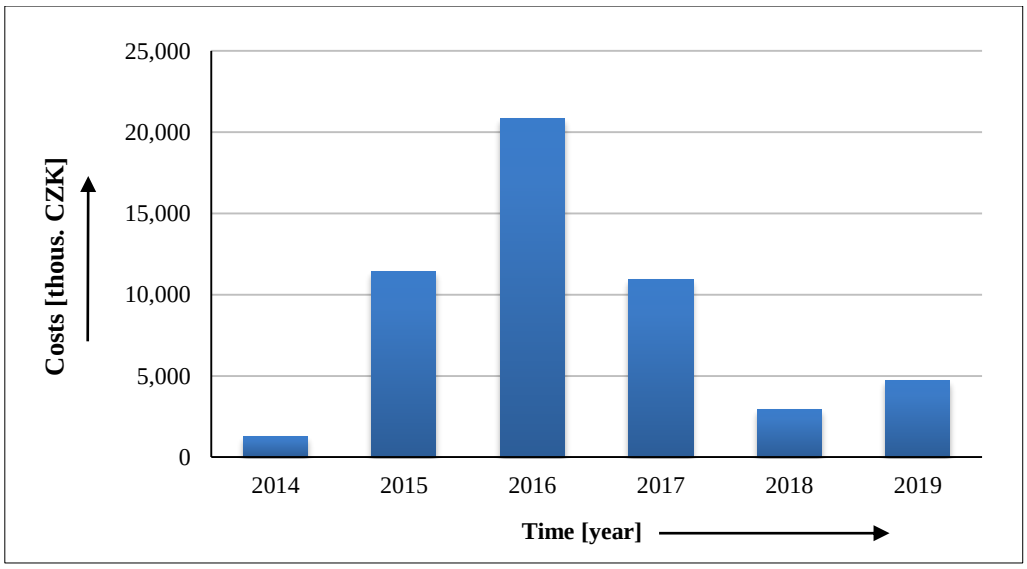

Figure 3. Development of FRSR expenditures regarding Vrbětice emergency in 2014–2019

Data on PCR expenditures were provided by the Department of Communication and External Relations of the Police Praesidium of the Czech Republic [53]. PCR incurred expenditures in the total amount of CZK 439,864,000 in 2014–2019, wage costs accounting for 65 % (CZK 286,594,000) of them. For the specific types of expenditures see Table 3.

Table 3. PCR expenditures in connection with the Vrbětice emergency in 2014–2019

Expenditure item	Amount
Wages of police officers and civil employees	286,594,000
FKSP, social security and health insurance premiums	101,997,000
Other current expenditures	35,021,000
Investment	16,252,000
Total	439,864,000

Most funds were spent in 2015 (CZK 102,620,000). In 2016 and 2017, there was a reduction in the expenditures incurred by PCR. By contrast, in 2018 and 2019, the trend grew (CZK 83,967,506 in 2019), see Figure 4.

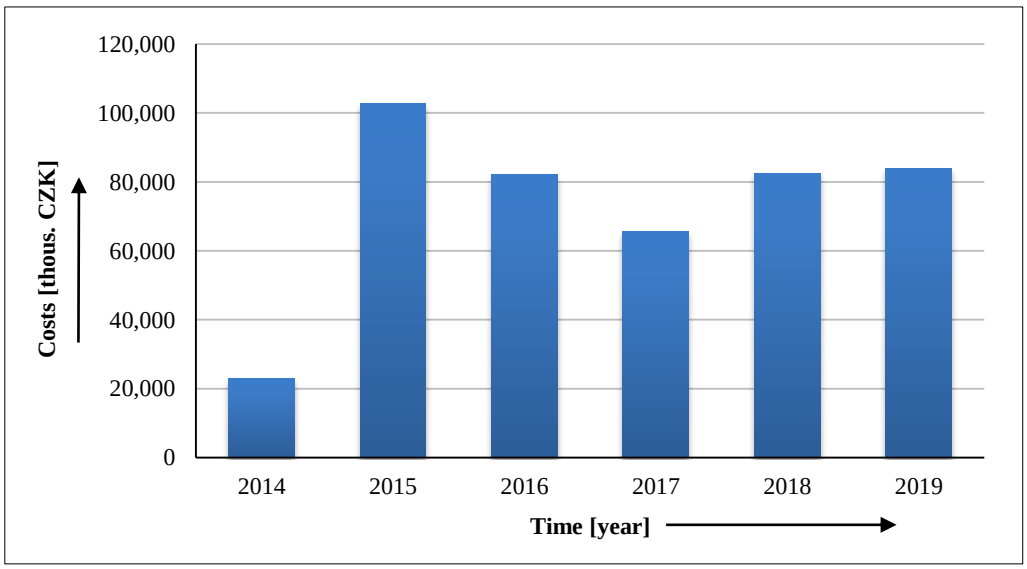

Figure 4. Development of PCR expenditures regarding Vrbětice emergency in 2014–2019

Zlín Region and Vlachovice Municipality

At the regional level, the regional authorities did not provide any data for this research [54]. Therefore, the data provided by the MFCR were used for the analysis of economic impacts on the regional budget [55]. In 2014–2019, the

MFCR reassigned a total of 90,159,000 to the budget of the Zlín Region. The funds were provided through tranches from the reserve funds under Chapter 398 - VPA of the State budget. They were intended primarily for operators to cover the costs under Act No. 239/2000 Coll., On IRS, in connection with the material and personal assistance provided in response to calls launched by the leader of the intervention team. In addition, the funds were reserved for the Emergency Medical Service of the Zlín Region (ZZSSK). The volume of funds reassigned from the State reserve funds to the budget of the Zlín Region gradually increased. In 2017 and 2018 this was followed by a gradual reduction of the funds provided from the State reserve funds. However, there was a significant increase again in 2019 (more than CZK 35,000,000) [55].

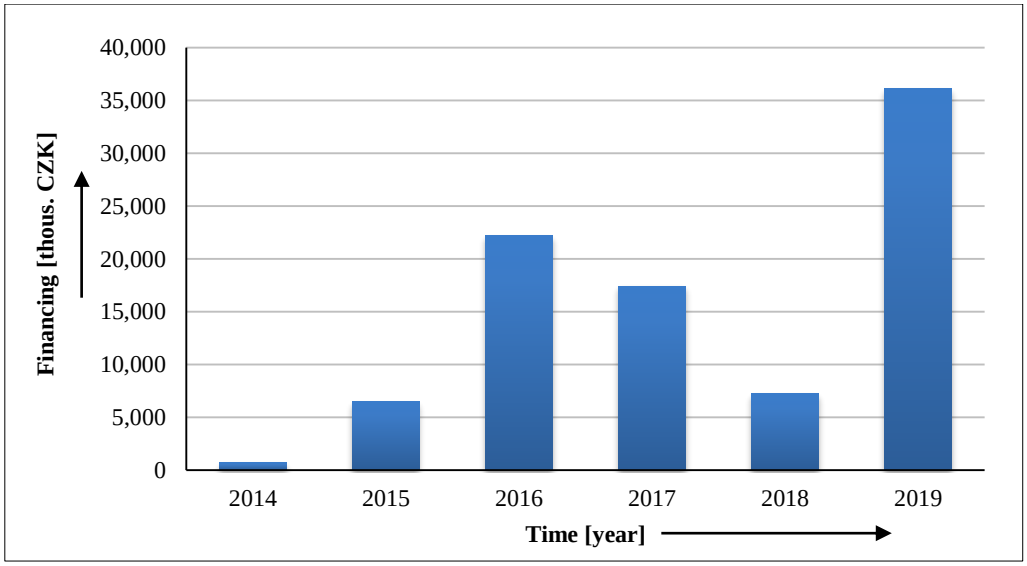

Figure 5. Funds transferred from the decision of the MFCR to the budget of the Zlín Region regarding Vrbětice emergency in 2014–2019

Expenditures at the municipal level, the expenditures of the Security and Legal Protection budget group of the Municipality of Vlachovice were researched, see Table 4. Using the available data, it is impossible to determine what amount out of the Security and Legal Protection budget group item was earmarked for the elimination of the effects of the emergency. However, it can be stated that in 2014–2016 there was an increase in security expenditures in the Vlachovice budget. In 2016 security expenditures also accounted for the largest share (19.6 %) in the total expenditures of the municipality. In 2017 and 2018, a declining trend in security expenditures and total expenditures of the municipality could be observed. In 2019, the municipality's security expenditure rose again.

Table 4. Trends in the expenditures of the Security and Legal Protection budget group in the municipality Vlachovice in 2014–2019 (in thousands of CZK)

Indicator	2014	2015	2016	2017	2018	2019
Security expenditures	499,000	716,000	4,725,000	407,000	167,000	352,000
Total expenditures of the municipality	27,883,000	34,264,000	24,060,000	34,312,000	29,966,000	30,368,000
Share in total expenditures	1.8 %	2.1 %	19.6 %	1.2 %	0.6 %	1.2 %

4-2- Environmental Impacts of the Emergency

Direct Impacts

To assess the impact of the Vrbětice emergency on the environment, the research analyses the results of air quality measurements after the explosions at the ammunition storage site. The monitored event could affect several environmental media, water, soil, and air, which are key parameters for the analysis of the environmental impact of the emergency. Unfortunately, water and soil parameters are not monitored at sufficiently short time intervals to allow the impact of the emergency to be assessed by either state authorities or private initiatives. However, measurements are available about the air pollution situation from the location in the emergency area at hourly intervals. In addition, due to its nature, the emergency had the potential to cause significant air pollution. Air quality indicators were therefore selected to evaluate the environmental impact. Due to concerns regarding the potential release of harmful substances into the air, the Zlín Regional Hygiene Station (ZRHS) and the FRSCR Frenštát pod Radhoštěm Chemical Laboratory monitored air quality in the affected area. Measures to be adopted by the residents were also recommended, such as avoiding opening the windows [57]. Three reports were published showing the results of the air quality monitoring. The measurements

were taken on 16 October 2014 and 3 December 2014. In the meantime, at the request of the ZRHS, another measure was taken on 29 October 2014. The air concentrations of the following substances were measured by ZRHS mentioned above [58, 59]:

- Common inorganic sources of pollution - CO, O_3, NO, NO_2, SO_2;
- Dust particles – PM_{10}, $PM_{2.5}$.

The limits of concentrations of the pollutants are stipulated by Act No. 201/2012 Coll., on-air protection [57]. Figures 6 and 7 summarises the results of the monitoring carried out by the ZRHS at the measuring point just outside the municipal office in Vlachovice. The data are interpreted using two graphs. For the sake of clarity, it was necessary to show the results for CO in a separate graph. The values taken at the same measuring point on 16 October 2014 after the first storage explosion were compared to those taken on 3 December 2014 in the aftermath of the second storage explosion [57-59]:

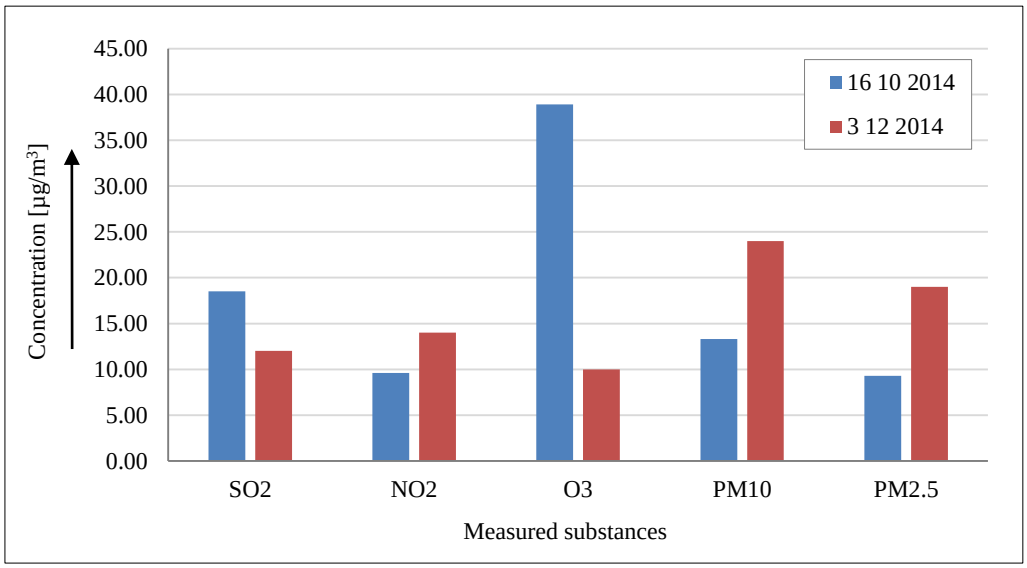

Figure 6. The concentration of SO_2, NO_2, O_3, PM_{10}, and $PM_{2.5}$ measured hourly

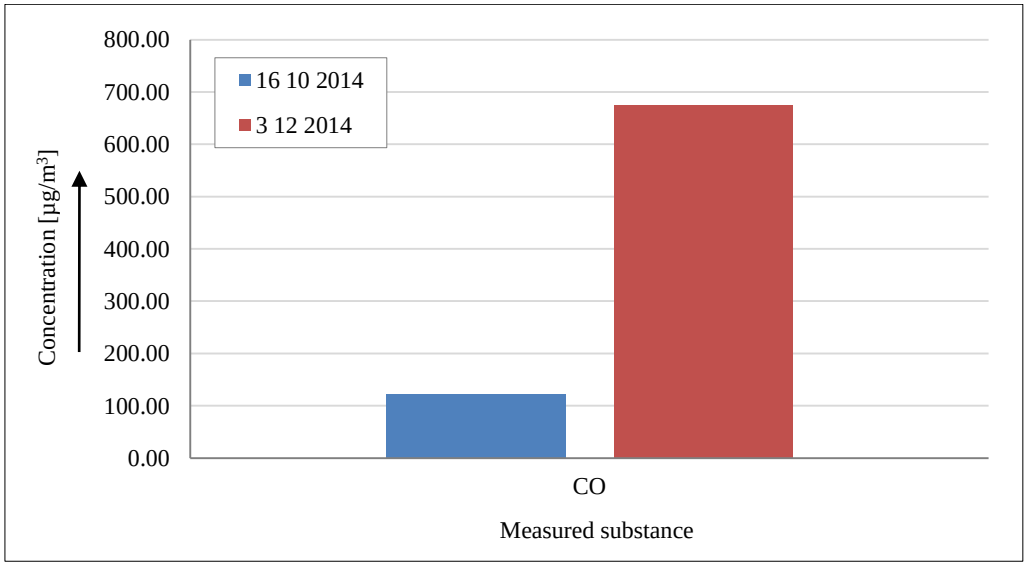

Figure 7. The concentration of CO measured hourly

Based on the measurement results, it was proved that the concentrations did not exceed the set limit value for any of the monitored pollutants. It was therefore not necessary to take any measures to ensure the protection of the health of the residents [57, 59]. An increase in air concentration could be observed for four of the six substances compared to previous values measured after the first explosion. The rise in concentration did not only occur for sulfur dioxide and ozone. The increase in concentration is most pronounced for carbon monoxide, which is a typical gas accompanying imperfect combustion (typically fires/explosions). A significant and rapid increase in the concentration of this toxic gas

indicates that the observed change is related to the emergency because there is no other source in the surroundings that could emit such an amount of CO in the observed time. Therefore, it can be assumed that the observed changes in the concentration of other gases at the same time are related to the same event. The increase is also evident for PM_{10} and $PM_{2.5}$ immissions, which also corresponds to the combustion processes. Similarly, an explosion and subsequent fire can be attributed to the increased concentration of NO_2, because it is the rapid heating and subsequent rapid cooling of the atmospheric air (explosion/fire) resulting in its formation. The changes in O_3 and SO_2 concentrations are probably influenced by other factors (dispersion conditions), which differed on both days. From this, it can be concluded that if the event occurred on 16.10. 2014, the measured air pollution values would be significantly higher. The ZRHS did not provide public comment on the reason behind the higher air concentrations for some substances after the second explosion [57, 59]. To verify whether the measured concentrations of increased air pollution were related to the emergency, the data were compared with the data measured at a more remote monitoring station. The measurement results are shown in Figures 8 and 9. The ZRHS took the measurements at several measuring points in the vicinity of the ammunition storage site [59]. To compare the monitoring results, we chose the measuring point outside the municipal office in Lipová (MM3), which was the closest one to the epicenter of the explosion, and a point near the entrance to the former Vlárské strojírny site, which was the furthest from it (MM4). Figures 8 and 9 show the comparison of the air monitoring results obtained on 3 December 2014 at the selected measuring MM3 and MM4 points.

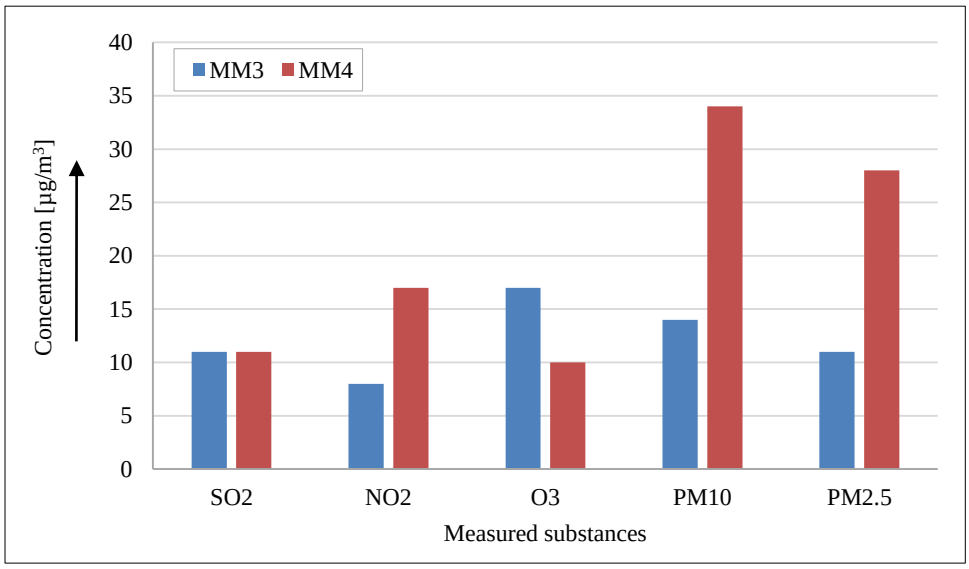

Figure 8. The concentration of SO_2, NO_2, O_3, PM_{10} and $PM_{2.5}$ measured hourly

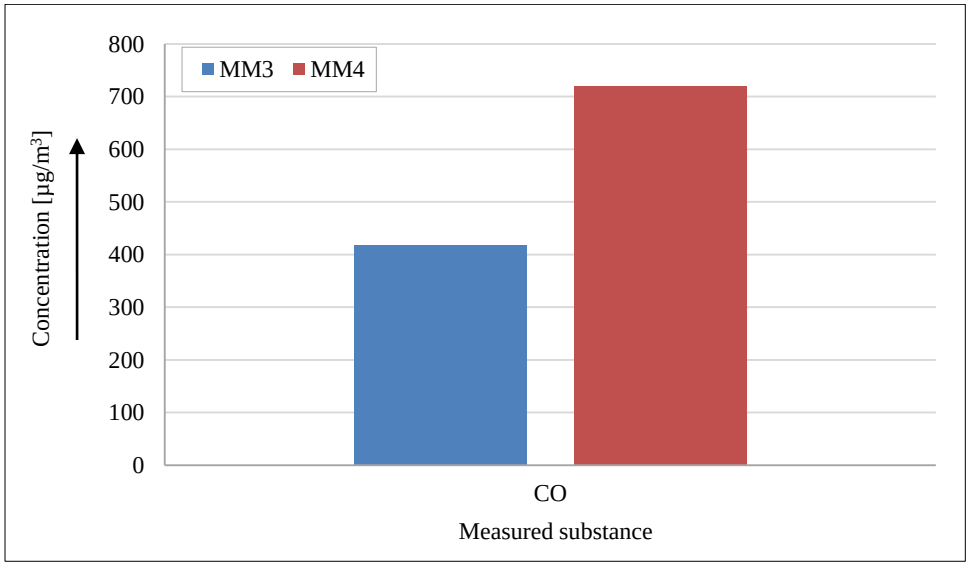

Figure 9. The concentration of CO measured hourly

In most cases, the measured concentration values were lower at the MM3 point compared to the MM4 measurement point. Only the value for nitrogen dioxide was higher at MM4. The air concentration of airborne dust ($PM_{2.5}$) exceeded the set limit value by three units, but this did not have any effect on the conclusion of the measurement. Whether other

harmful substances got into the air was not part of the measurement. There is no data on water and soil contamination on the ZRHS website [57-59]. As part of this study, we reached out to the director of the Department of Occupational Hygiene of the ZRHS in March 2020, and she confirmed it was not necessary to adopt measures to ensure public health as the set air pollution limit values had not been exceeded [60]. In June 2015, water and soil quality measurements were taken ex-post in the town. These were carried out at the municipality's request by the analytical laboratory of Vodní zdroje Holešov a.s. Even in this case, it was confirmed the set limits had not been exceeded.

Induced impacts

In addition to the direct environmental impacts, it is important to research the extent to which the environment is secondarily affected by additional induced damage. In this study, attention is focused on additional emissions associated with the activities of the PCR in the years 2014-2019 in case of this emergency. Induced CO_2 emissions were chosen as an indicator for inducted environmental burden. The reason is the fact that the value of emitted CO_2 correlates with both additional energy consumption and other air pollutants. It is therefore a representative indicator of additional environmental burden. In addition, it can be recalculated from accounting data on spent fuel, which can be assigned to the researched incident, as the following procedure shows. The total induced CO_2 emissions as a result of the activities of the PCR were calculated according to the formula:

$$E_{co2} = (s_p \times V \times ef_p) + (s_d \times V \times ef_d) \quad (1)$$

Where E_{co2} represents the volume of induced CO_2 emissions from transport; s_p is the share of petrol in total fuel consumed; V is the total volume of fuel consumed; e_{fp} is the CO_2 emission factor for petrol; s_d is the share of diesel; e_{fd} is the CO_2 emission factor for diesel. The values of emission factors were set according to [61]. The s_p/s_d ratio was set at 50/50 for the calculation, as there is no data for this value. Optimistic and pessimistic scenarios were calculated for variants where the ratio would be 100/0 and 0/100. The real values move with 100% certainty in the calculated interval. The value of V was calculated based on average prices for the given year according to [62] from the reported incurred costs according to the formula:

$$V = \frac{f_C}{\frac{p_p + p_d}{2}} \quad (2)$$

Where f_C represents the fuel cost for a given year; p_p is the average price of B.A. 95 petrol; p_d is the average price of diesel for that year. By substituting the values from Table 5, which shows the expenses related to the emergency in Vrbětice of the PCR for fuels in the years 2014-2019, into Equations 1 and 2 the values given in Figure 10 were calculated.

Table 5. Expenditures of the PCR for fuels in 2014-2019 in CZK [54]

	2014	2015	2016	2017	2018	2019
Fuel - sum	692 328	4 907 081	2 471 629	3 942 646	3 134 472	2 782 393
Fuel - PCR gas stations	59 175	90 533	226 984	1 240 732	11 987	893
PCR fuel cards	633 153	4 815 868	2 222 034	2 701 914	3 122 337	2 781 500

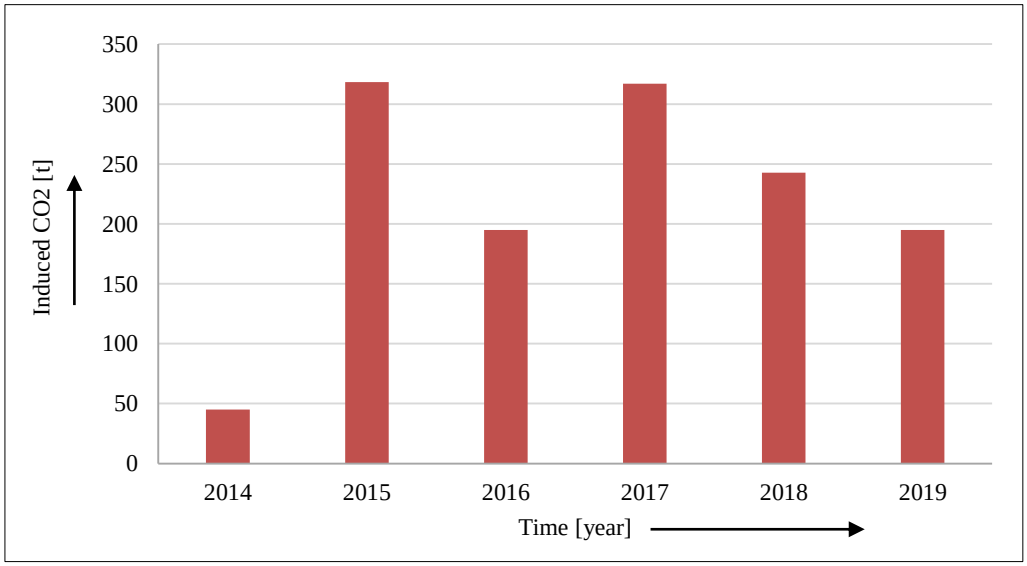

Figure 10. Induced CO_2 emissions

As can be seen from the calculated values, the total CO_2 emissions that were induced by the emergency are in the case of the PCR vehicle fleet range between 1130.1 - 1495.5 t CO_2, which corresponds to the amount of emissions that would be caused by e.g., burning 828t of brown coal (for a value of 1312.81 t CO_2).

4-3- Social Impacts of the Emergency

The development of questions for the questionnaire survey was based on the perception of safety for quality of life assessment. The first questionnaire survey was based on the current research needs of the municipality of Vlachovice after the event. The second survey was conducted by our research team and was based on Maslow's theory of the hierarchy of needs [17], the Human Security Index [35], and BLI [36]. In addition to these theoretical definitions, the second questionnaire survey also used the Summary of final reports of expert groups to identify relevant indicators of quality of life in the Czech Republic [37], which were used to define QLP indicators [38].

Shortly after the emergency, a petition was drawn up by the residents and submitted to the Petitions Committee of the Chamber of Deputies of the Parliament of the Czech Republic to remove all ammunition and hazardous material from the Vrbětice ammunition storage site. Over 6,000 signatories protested against the continued storage of material at the Vrbětice ammunition storage site. A questionnaire survey was conducted in 2015 in the town of Vlachovice through the municipal newsletter [63].

The questionnaire contained four questions regarding the past and the future of ammunition storage sites. A total of 116 questionnaires were submitted, and among other things, they led to the following conclusions: a) the majority of the survey participants did not agree with the use of the site in 2006–2014, b) the respondents mostly disagreed with the future ammunition storage at the site once the consequences of the emergency are removed. Closer attention will be given to these two areas to cast light on any changes in residents' current position. The second questionnaire survey was conducted in 2020 in which these two questions from the 2015 questionnaire survey were used, among others. The aim was to establish the subjective views of security by the residents and track any changes in their opinions after the emergency. The questionnaire contained a total of thirteen questions, and in cooperation with the Mayor of Vlachovice, the questionnaire survey was conducted between 13 March and 15 May 2020. Out of the 1485 residents (767 women and 718 men) [64], 230 respondents filled in the questionnaire (15 % of the population of the municipality). 146 women (64 %) and 83 men (36 %) took part in the survey. Residents aged 27–45 (36 %) accounted for the most populous group of respondents, followed by people aged 46–59 (24 %). The 18–26 age group was the least populous in the survey (17 %). The over 60 age group (23 %) mostly handed in the questionnaires in writing. 99 respondents (43 %) had completed secondary education, 57 respondents (25 %) completed secondary education without a school-leaving exam. 51 respondents (22 %) had a university degree, 22 respondents (10 %) had elementary education. A total of 105 respondents (46 %) feel safe in their place of residence, 65 respondents (28 %) feel rather safe. 8 respondents (3 %) do not feel safe.

According to Šándor (2020) [46], the situation after the explosions of the storage sites might seem relatively confusing and chaotic to the residents. However, most respondents - 83 (36 %) expressed their satisfaction with the organization and the information provided in dealing with the emergency by the competent authorities and departments while 79 respondents (35 %) were rather dissatisfied. 122 respondents (53 %) felt less safe due to the explosion of the ammunition storage sites than before the emergency; 66 respondents (29 %) reported no change in their subjective feeling of safety and still felt safe. 23 respondents (10 %) felt unsafe risk before and after the emergency. 18 respondents (8 %) felt safer after the explosion of the ammunition storage sites. 123 respondents (54%) indicated their lack of confidence in the state and its ability to increase security. 79 respondents (34 %) stated their view of the state did not change in the aftermath of the emergency. 27 respondents (12 %) reported their improved confidence in the state. After the emergency, 134 out of the 229 respondents (59 %) followed more closely events in Vlachovice and its surroundings. A total of 95 research participants (41 %) said they did not follow the events in the municipality more closely than before the emergency. The following two questions corresponded to those the municipality of Vlachovice included in their questionnaire in 2015. It was, therefore, possible to compare the views from 2015 and 2020. As for the opinions of using the ammunition storage site in 2006-2014, the results are described in Table 6. As for the opinions of the future operation of the ammunition storage site after the completion of the remediation works, the results are described in Table 7. There are questionnaire answers in these following categories: Cat_1 represents I agree with the storage of ammunition; Cat_2 is I agree with the transfer of the area to the ownership of the municipality; Cat_3 is I agree with operation of company Bochemie; Cat_4 is I do not agree with operation of company Bochemie; Cat_5 is I do not agree with the transfer of the area to the ownership of the municipality; Cat_6 is I do not agree with the storage of ammunition and Cat_7 represents I have got a different opinion. Immediately after the explosion, disagreement with using of ammunition storage in 2006-2014 is evident (58 respondents). In 2020, it is clear how, over time, respondents changed their views towards a neutral position on the problem (65 don't care). In the case of opinion on the future use of ammunition storage, it is evident that in 2015 the respondents were in most reactions against the use of the ammunition storage in the future (33 respondents). This view persisted in 2020 (38 respondents).

Table 6. Comparison of the opinions of using the ammunition storage site in 2006-2014 (in %)

Questionnaire	Evaluation of answers			
	Agree	Disagree	Don't care	Different opinion
2015	2	58	21	19
2020	9	23	65	3

Table 7. Comparison of the views of the future operation of the ammunition storage site after the completion of the remediation works (in %)

Questionnaire	Evaluation of answers						
	Cat_1	Cat_2	Cat_3	Cat_4	Cat_5	Cat_6	Cat_7
2015	4	19	5	31	5	33	4
2020	10	20	3	19	5	38	5

5- Results and Discussion

In the introduction to this article and the Data and Methodology chapter, we argue that MMR is a suitable approach for emergency research. For this reason, attention will be paid to this in the following paragraph, including considerations on the possible further use of the MMR. For this research, it was on purpose chosen an emergency that has a regional character. This choice allowed the use of MMR in an environment that will be enabled to obtain the necessary relevant and verifiable data for research needs. Based on the research results confirm, that MMR provided a comprehensive view of the emergency. Therefore, it can be stated that MMR is a suitable methodology for researching regional or local emergencies. In addition, it can also be noted that the proposed procedure can be generalized and used in case of more serious emergencies as a tool for the needs of public managers in particular. It can therefore be stated that the objective of this article, i.e. to process a comprehensive assessment of an emergency and create a robust tool for public managers that could evaluate whether and in what way emergency affected the community and region using MMR, has been achieved.

The researched areas correspond to three pillars of sustainability. Usually, only one scientific method is used for comparison. In the case of using MMR, this is an original approach to how the impact of emergencies also in the context of sustainability can be researched in one study. If the rhetoric of sustainability is maintained, different approaches depending on the individual pillars were used in this study. The procedure proposed here opens up a methodological concept, which represents an exciting perspective on researching not only the impacts of emergencies on the three pillars of sustainability using MMR. As a topic for further research, this article introduces the possibility of applying the MMR to research in sustainability in general because the combination of qualitative and quantitative methods in one study proves to be suitable for research on this complex phenomenon. The study suggests that it is possible to research the impacts using a combination vector. The various possibilities of the combination vectors shown in the matrix in Table 8 can be used for comprehensive research. This study used a vector corresponding to the second row of the matrix.

Table 8. Combination matrix

Environmental area	Social area	Economic area
Qualitative	Qualitative	Qualitative
Qualitative	Qualitative	Quantitative
Qualitative	Quantitative	Quantitative
Quantitative	Quantitative	Quantitative
Quantitative	Quantitative	Qualitative
Qualitative	Quantitative	Qualitative
Quantitative	Qualitative	Quantitative

Regarding the research outputs in the economic field, it is necessary to mention the framework of the research and the resulting assumptions. The emergency caused primary and certainly secondary economic impacts. In the case of secondary impacts, it is possible to mention, for example, the subsequent impact on the economic quality of life of residents. There were also casualties. Life loss in connection with the economy is in itself a specific area that this study does not address. However, this paper focus on the expenditures related to the primary, direct economic impacts on state administration and local self-governments in 2014-2019. In the case of state administration, as regards direct economic impacts, it can therefore be stated that a total of CZK 213,354,000 was released from Chapter 398 - VPA of the State budget of the CR in 2014–2018. Most of these funds came from the specific-purpose reserve fund earmarked for

addressing and preventing emergencies and eliminating their consequences. The largest part of these funds was transferred between the state body, which ensures internal security and regional local self-government, i.e. to the chapter of the MICR and the budget of the Zlín Regional Office, with the MDCR getting hold of the smaller part as a contribution to its chapter. The largest amount of the funds was released in 2015. In the case of other stakeholders, in 2014-2019, the FRSCR incurred expenditures in the total amount of CZK 52,052,000. HZSCR's expenditures in connection with the emergency were covered mainly from Chapter 398 - VPA; other funds were released from the MICR budget. The largest amount of funds was spent in 2015, 2016, and 2017, a significant decrease in expenditures follows in 2018. As the FRSCR dealt with the remediation of the impacts of the emergency, this period corresponds to the intensive deployment of the FRSCR.

The PCR incurred expenses of CZK 439,864,000 in 2014–2019. With a total of CZK 286,594,000, wages accounted for the largest part of the expenses. The PCR spent the largest amount in 2015, however, unlike the FRSCR's expenditures in the coming years, they do not fall significantly. This is in line with the ongoing emergency investigation that is currently ongoing. In the case of regional local self-government, in 2014-2019, the MFCR, as a state budget administrator, reassigned a sum of CZK 90,159,000 from the Chapter 398-VPA reserve funds to the budget of the Zlín Region Office. The funds were specifically intended to cover the expenses incurred in connection with the material and personal assistance to be provided based on calls launched by the leader of the intervention team and as funds for the ZZSSK, which is established and partly financed by Zlín Regional Office. Most of the funds were provided in 2016 and 2019. At the municipal self-government level, the impact on the budget of the municipality of Vlachovice was researched. The expenditures on Security and Legal Protection budget group, growing between 2014 and 2016, were researched closely. Most security expenditures were debited to the municipality's budget in 2016, it is a year after the emergency because the emergency occurred at the end of 2014. That year, the share of security expenditures in the total expenditures of the municipality was 19.6 %. It can therefore be concluded that the increase in funds spent on security in 2014-2016 is related to the emergency and its impacts, therefore, affected the expenditures of the municipality of Vlachovice. The discussion on the economic area concludes that the emergency had an impact in the form of financial costs on the researched representatives of state administration and self-government with the different trend. However, the years 2015 and 2016 were the most critical in terms of expenditures, except for funds that the MFCR transferred to the Zlín Regional Office budget in 2019.

In the case of environmental impacts, research has focused on air pollutants. As part of their research, we analyzed direct - primary and induced - secondary impacts. In addition to how the emergency primarily affected the environment, we wanted to demonstrate that crises that require extensive and long-term intervention by the rescue system also produce additional environmental burdens in the form of rescue system activities. Due to the nature of this study, PCR activities associated with the emergency were selected. The trend of PCR expenditures in 2015-2019 shows relatively constant activity. In the case of direct impacts, an analysis of the measured values of ZRHS showed that after the emergency, the concentrations of four out of the six basic air pollutants increased. The reasons behind the increase in the concentrations of basic pollutants were not explained by the institutions we reached out to. The measured concentration values were different at the different measuring points and various distances from the epicenter. However, it should be noted that in none of the cases the limit value set by law was exceeded. Based on the research results, it can be stated that the air was not affected by the explosions of the ammunition storage. It should be added, however, that the emergency caused induced environmental impacts. In this study, it was proved that the PCR fleet produced in connection with the emergency in the years 2014-2019 CO_2 emissions ranging between 1130.1 - 1495.5 t CO_2, which corresponds to the amount of emissions that would be caused by e.g., burning 828t of brown coal (for a value of 1312.81 t CO_2).

Because a questionnaire survey was conducted by the municipality of Vlachovice in 2015, the questionnaire was designed in such a way that it was possible to compare selected questions with those from 2020. Based on data from questionnaire surveys from 2015 and 2020 the change in attitude to the past of the ammunition storage area is evident. While, immediately after the explosions, most of the respondents disagreed with the location of the ammunition storage. In 2020 respondents changed their views towards a neutral position. There is a different development in attitudes in the case of future use of the area. In 2015 the respondents were in most reactions against the use of ammunition storage in the future and this persisted in 2020. So, while five years after the explosion, the past of the area where the ammunition storage was located was no longer of interest to citizens, the future of the area and the associated feeling of security is still a living issue. Other partial conclusions can also be drawn: the emergency reduced the feeling of security among the residents; the emergency increased their interest in what was happening in the town and the region; even most of the respondents (36%) viewed communication with authorities optimistic their confidence in local government and its ability to deliver security declined; the residents disagreed with the continued storage of ammunition; according to the residents, inspections of the civilian operators handling the ammunition could help prevent similar emergencies. The social impacts discussion can also be added to by the observations of Šándor (2020) [46], who assessed the situation as rather chaotic, confusing, and not entirely well thought through. For example, the residents of the affected municipalities were relocated several times. There are also several different ammunition protection standards for the public and private sectors, while at the site the ammunition was stored by private companies. "*There should be clear and single requirements for how ammunition is to be stored (ammunition for military and other weapons, ammunition intended for export, etc.)*." [46]. The residents could see this as a negative and feel insecure as a result.

If the design of this research is compared with similar studies, it can be stated that the procedure proposed by us differs in scope. Studies of a similar nature focus on a detailed analysis of one relationship of the event (war, explosion) to the observed phenomenon e.g. [65, 66], or they research the physics of the explosion as such in detail [67, 68]. Works that seek a more comprehensive overview and include social and economic impacts are rather descriptive [69]. The uniqueness of this researched problem has a significant determining effect. First, due to the specific and limiting dataset, testing different variants using other datasets seems problematic. Second, as demonstrated in the Theoretical background chapter and on the lines above, comparisons with similar studies and their results, including their interpretation, reach their limits.

6- Conclusion

In the academic and application spheres, continuous effort is deployed to improve central and local government by identifying new approaches and tools. The aim is to ensure the best possible public service is delivered the confidence of the population in public institutions is reinforced. Through the operation of the synergistic effect, such confidence then translates positively into an increased level of citizen participation in the administration of public affairs, which is in itself an indicator of the quality of the system as such. This study focuses on the economic, environmental, and social impacts of emergency and related security which plays a crucial role in the portfolio of public services. The objective of this article is to process comprehensive research of emergency as a tool that may improve the effectiveness of public managers´ decision-making using MMR. In this study, the MMR methodology was used to quantitatively and qualitatively research the impacts of the emergency. The benefits of the study can be determined on both practical and theoretical levels. From the practical point of view, we must accept that public managers' decision-making should be based on the most accurate knowledge of reality combined with a correct understanding of the context. Applying the proposed concept has the potential to improve decision-making by providing an adequate range of necessary information. Experience in implementing comprehensive assessments of emergencies can specifically be used to create strategic documents and public policies in emergency management. On a theoretical level, the study has contributed to the expansion of current knowledge in the case of the application of the MMR for emergency research. The use of sub-methods made it possible to focus on economic, environmental, and social areas in one study.

The economic impact has been researched in the context of fiscal federalism. In the case of this study, it was an explosion of ammunition storage in Vlachovice, Zlín Region, the CR. The research showed that all selected participants were financially affected by the emergency. The state budget, the budgets of the relevant ministries, FRSCR and PCR budgets, and the budgets of both levels of local self-governments showed increased expenditures. The research also proved that the emergency did not primarily cause direct damage to the selected environmental segment - attention was focused on the air. In none of the analyzed measurements were the limits exceeded, but the induced effects on the air were proved. In the case of induced impacts, the environmental burden of the PCR fleet related to its actions during 2014-2019 was identified. During these years, CO_2 emissions ranging between 1130.1 - 1495.5 t CO_2 were detected. From the social perspective, the local community was affected by the emergency. In the case of the past and the future of the area where the ammunition storage was located before the explosion, the attitudes of the respondents were compared based on data from 2015 and 2020. The results showed that the past of the area, five years after, is not a topical issue for citizens, while the future is. Most respondents do not want ammunition storage to be located in the area again in the future. In addition, other relatively worrying conclusions can be made based on data from the 2020 questionnaire survey. In the context of the current discussions on declining the trust in the state and its institutions, it is essential to show that the emergency reduced the residents´ subjective sense of security and the trust in authorities, which should be, for public managers a challenging fact.

7- Declarations

7-1- Author Contributions

Conceptualization, J.F.; methodology, J.F., K.J., J.K., and R.B.; validation, J.F., and J.K.; formal analysis, J.F. and K.J.; investigation, J.F. and K.J.; resources, J.F. and K.J.; data curation, R.B. and J.K.; writing—original draft preparation, J.F. and K.J.; writing—review and editing, J.F. R.B., and J.K.; supervision, J.F. All authors have read and agreed to the published version of the manuscript.

7-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7-3- Funding

Authors received financial support from the University of Pardubice.

7-4- Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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