Title

Cross-border cooperation - an alternative for remote border regions? Case study of fire protection in Olomouc Region, CZE

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Abstract

The size of municipalities and their geographical location are often closely related to the economics of their operation, the efficiency of provided administrative activities, the need to provide ever higher quality and availability of public services, the creation of optimal conditions for local / regional development, and state-building aspects associated with gradual transformation for multilevel governance. Remote border regions represent a specific case, for which cross-border cooperation with varying intensity of its institutionalization can become a viable alternative to multilevel governance.

Current research focuses on the effectiveness of providing local public services in alternative ways, typically utilizing inter-municipal cooperation or the privatization of these services. A less known alternative within the EU is cross-border provision of local public services (ESPON).

The aim of this paper is to identify and examine the main factors influencing the effectiveness of cross-border cooperation as an alternative of local public services provision using example of fire protection. According to the analysis of data for this case study, it is clear that this is not a very common way of providing basic fire protection, but it is mainly an increase in the level of ability to react.

The main goal of this paper is to consider the importance of border municipalities, cross-border cooperation is in fire protection provision as an efficient alternative to the inland-based expansion of coverage. In this research, we also dealt with identifications of factors are likely to determine the efficiency of ensuring cross-border fire protection in comparison with national organization.

For the purposes of this paper, we chose reference territory of the northern Olomouc Region in the Czech Republic with a total of 102 municipalities and directly adjacent Opole Region in Poland and statistical data about fire brigades interventions in the area during 2015–19, including response times and standardized costs. The data were processed using set theory and data structuring.

Analysed region represent an area relatively distant to the regional centre with low population density, making it problematic to ensure sufficient coverage by inland fire protection. As a reaction to these conditions, the cross-border cooperation of fire protection units with both common and emergency incidents occurring in border areas has been gradually developing. However, so far there has been rather little attention paid to this alternative service provision model.

Results of the analysis show that for municipalities located directly on the borders, cross-border cooperation of fire brigades represents an effective alternative for ensuring fire protection with Shorter time of arrival coming up as the key factor of added value of cross-border assistance. Utilization of cross-border assistance proved efficient also in financial terms.

Points for Practitioners

This contribution and the research carried out are based on the practice of cross-border fire protection, which is by no means systemic. In particular, it is a pilot part of a broader examination of the effectiveness of the organization and the provision of fire protection in an alternative cross-border model for peripheral border regions. The aim of this paper is based on historical data and qualitative research, to identify the main factors influencing the effectiveness of cross-border cooperation, as alternatives for the provision of local public services on the example of fire protection on the Polish-Czech border. Another partial goal is to identify localities in which cross-border cooperation and sharing of fire protection infrastructure is more effective than providing these services only at the national level so that scientific knowledge can be subsequently used in practice in public policy making, setting rules for financial instruments or developing institutional forms of cross-border cooperation (multilevel governance).

Keywords

Cross-border cooperation, fire protection, borderland, local public services, effectiveness, public policy

Introduction

The size of municipalities and their geographical location are most often related to the economics of their operation, the efficiency of administrative activities, the need to provide ever higher quality and availability of public services, the creation of optimal conditions for local / regional development and state-building aspects associated with gradual transformation. for multilevel democratic governance (Ježek, 2010). Especially for border regions, which often face poor transport infrastructure and limited availability of local public services, cross-border cooperation with its different intensity of institutionalization may be one of the alternatives to multilevel governance (Princen, 2014).

Current research focuses on the efficiency of providing local public services in alternative ways, especially on inter-municipal cooperation or privatization of these services and their effectiveness (Warner and Bel; 2014, Bel and Warner, 2015; Soukopová and Vaceková, 2018). However, in case of border regions there exist also another, often overlooked, alternative in the form of the cross-border provision of local public services. Researchers only recently began to pay more attention to this phenomenon, especially in the European Union (EU) (ESPON, 2019). From its nature, Cross-border cooperation can serve as an alternative for geographically inaccessible border regions in the organization and provision of local public services, and is specifically suitable for highly inclined critical infrastructure, like fire protection or emergency health care and public order. Within EU, there are several areas where ensuring security and internal order is based primarily on cross-border cooperation, for instance mountain areas on the Polish-Czech border). Such cross-border cooperation significantly speeds up the reaction to incidents in geographically inaccessible or low density of regions.

In this paper we chose to examine delivery effectiveness of public service of fire protection in border villages along the Czech-Polish border, currently mandated by the by law. Cross-border cooperation aspect has been so far very under researched, both in the Czech Republic and abroad, and most researches about the provision of fire protection focus on factors of production efficiency (In particular assessment of the effectiveness of the length of interventions through theoretical regression models), and do not address cross-border cooperation factor in any way (Jaldell, 2019; Krasuski et al., 2012). In our opinion, matter of cross-border provision of public services represents a gap in the current literature with very little research done, and by this paper we aim to contribute to narrowing this gap.

The aim of this paper is to identify and examine the main factors influencing the effectiveness of cross-border cooperation as an alternative of local public services provision using an example of fire protection.

The main goal of this paper is to consider the importance of border municipalities, cross-border cooperation is in fire protection provision as an efficient alternative to the inland-based expansion of coverage. In this research, we also dealt with identifications of factors are likely to determine the efficiency of ensuring cross-border fire protection in comparison with national organization.
For the purposes of this paper we chose reference territory of the northern Olomouc Region, CZE (Jeseník and Šumperk districts with a total of 102 municipalities) and directly adjacent Opole Region (PL). Both Czech districts represent an area relatively distant to the regional centre with low population density, making it problematic to ensure sufficient coverage by inland fire protection. The analysed data for both districts relate to the period 2015-19.

1. Cross-border provision of local public services

Since the Czech Republic's accession to the EU (2004) and the Schengen area (2007), many internal border regions experienced very rapid growth from the perspective of basic macroeconomic indicators and quality of life. At the same time, however, they are facing negative demographic effects. According to regional (Molak; Huk, 2012) and local researches (Cestra, 2014), relatively new phenomenon of functional cross-border regions is gradually emerging, and subsequently becoming also a new tool for territorial management - including the provision of public services. A cross-border functional region can be defined as a closed region / territory with regard to its coherence of interventions aimed at meeting social needs and consistency of socio-economic conditions without geographical constraints - regardless of formal administrative borders (including state borders) (Molak; Huk, 2012).

According to a study prepared by the European Grouping of Territorial Cooperation ESPON (ESPON 2019), territorial cohesion across the EU's internal borders is reflected in the provision of cross-border public services, even if there is no precise definition. Specifically, cross-border services have been most widely implemented in the areas of environmental protection, crisis management and emergency or transport capacity. Best examples of cross-border cooperation also include field of spatial planning, tourism and culture in order to create synergies and provide most for both locals and tourists.

mentioned surveys identified that the main goal of cross-border cooperation is two-fold; to reduce the negative effects associated with the existence of state (administrative) borders, and to build new opportunities and increase attractiveness of border regions. In its study, ESPON specified 3 main expected results from the organization and delivery of local public services in a cross-border context:

1. Addresses shortcomings and gaps in the provision of national services. Thanks to cross-border provision, the lack of services provided on one or both sides of the border can be overcome. Such a shortcoming may be the result of a peripheral geographical location in relation to the hinterland or low demand on each side of the border. Examples can also be mentioned where, with regard to territorial and geographical barriers, the flow of local public service provision is not natural inland (the capital of the regions), but across the border (eg Jesenicko).

2. Cross-border services can lead to development changes in the regions. Despite the sharing of potentials, resources and infrastructure, more effective solutions in the organization and provision of public services can be expected than individual and non-cooperative generative activities. The change may also be due to the extension of existing national services across borders, for example in shortening the uptime of integrated rescue systems.

3. By providing cross-border public services, they will be less costly - they can increase efficiency and reduce costs for service providers compared to domestic service provision. By increasing the circle of potential users, a cross-border public service can bring economies of scale by covering a wider range of services than domestic services, thus increasing the demand for the service. There will be a better use of investment and sharing of operating costs between stakeholders in the cross-border region.

These assumptions were defined on the basis of an analysis of 579 cross-border public services across the EU (ESPON 2019). The study also identified key challenges for Member States and the EU in order to improve and facilitate the cross-border provision of public services. These include the simplification of legislative measures in the field of setting up cross-border legal entities for the provision of joint public services (eg European Groupings of Territorial Cooperation), simplification and expansion of funding from INTERREG programs, eliminating differences in national legal systems to avoid obstacles to cross-border public services etc. (ESPON 2019). It is to address this recommendation that the Association of European Border Regions (AEBR), together with the European Commission (DG REGIO), has set aside a special "B-solution" grant scheme to remove legal, administrative and institutional barriers in cross-border public services.

1.1. Current state of research in the field of cross-border provision of integrated rescue systems

Current research into the functioning of cross-border cooperation in integrated rescue systems has in recent years focused more on the institutional, socio-political and legal aspects of such cooperation. The economic aspects of cross-border cooperation are mentioned mainly in the context of the functioning of European Territorial Cooperation programs under the European Regional Development Fund, not in terms of its financial efficiency (Beck 2017). Transnational, interregional and cross-border cooperation programs are an important tool in EU cohesion policy to support the development and sustainable functioning of cooperation across the thematic areas for which there is potential at the border. These programs are an additional external source for local and regional budgets to finance activities that go beyond the normal legal obligations of self-government (Medeiros 2019). According to Sebastiaane Princen (zdroj), however, economic aspects do not form the basic motivation for cross-border cooperation. In recent years, the literature has paid dominant attention to the definition of barriers to cross-border cooperation. These are defined very broadly: from linguistic-cultural, technical through legal, institutional to political, etc. For the purposes of this dissertation, their identification is essential, because their financial statements will be quantified within the research part.

Cross-border cooperation can serve as an alternative for geographically inaccessible border regions in organizing and providing local public services, which undoubtedly include widely perceived security (fire protection, health care, health and life, etc.) and public order. At the EU's internal borders, there are several cases where ensuring security and internal order is based only on cross-border cooperation (eg in the area of the Giant Mountains on the Polish-Czech border). This cooperation makes it possible to significantly speed up the delivery of aid, for example in geographically inaccessible regions (such as mountain areas, areas with a low density of the road network, densely forested areas, etc.). Local and regional authorities are increasingly involved in ensuring cross-border security, across the European Union. These are mainly the basic components of integrated rescue systems such as the police, fire brigade or less often medical services (KEEP, Interact). Cooperation with local and regional authorities responsible for crisis management is often an integral part of these activities. Cross-border IRS cooperation can be divided into two groups (Gabryšová, Ciechomski, 2019):

1. The first associated with day-to-day cooperation in the exchange of information, cooperation in combating crime, environmental monitoring, etc. - it is a systemic cooperation, which does not fundamentally deviate in its specificity from other thematically focused models of long-term institutional cross-border cooperation.

2. Associated with the capacity to deal with emergencies and crises which require intervention on the other side of the border (due to better transport accessibility and shorter travel times to the scene) or joint intervention (often larger events such as forest fires, floods , disasters in the field of the environment, or events with a larger number of participants, etc.).

However, this cooperation is not evenly represented at all borders within the EU, it has primarily a local or regional dimension (KEEP Interact, 2020). The oldest models of cooperation in this area include the Dutch-German border, where IRS cooperation began in 1958. The most advanced in the field of cross-border IRS cooperation are France, Germany, the Netherlands, Belgium, etc. An example can be very close and long-term police cooperation in regions of the Meuse - Rhine Euroregion or French-British IRS cooperation in the English

Channel area (Gallager, 2002, Johnson, 2002). In recent years, there has been a significant shift in institutional, systemic and sustainable cooperation across IRS units on the Austrian-Czech and Czech-Polish borders, including through the implementation of the flagship project "Safe Border" and "DrugStop" funded by the Interreg VA Czech Cross-border Cooperation Program. Republic - Poland (Gabryšová, Ciechomski, 2019).

Based on a review of the literature, several forms of cross-border cooperation in the field of IRS can be identified:

1. Cooperation within the framework of intergovernmental conventions and agreements - general framework of cooperation without specifying detailed methodologies and procedures (most often in the field of extraordinary, long-term and significant events, etc.) resulting from general provisions on the European Union and basic principles of its functioning. More detailed procedures are set out in methodological support materials and are part of larger crisis plans, eg international, national or regional. One example is the ECPM - EU Civil Defense Mechanism. In the years 2017-2018, it was most often activated during large-scale forest fires, floods and environmental disasters. It is a transnational mechanism, but often uses existing cross-border links to be effective and reduce intervention times (Lotter, 2077 and ER, 2020).

2. Cooperation within the framework of regional and local agreements - usually has more precisely defined rules and methodologies of procedures in the case of joint interventions, resp. interventions on the other side of the border. This cooperation is of local importance without the involvement of state administration bodies. Thanks to the established personal contacts, this type of cooperation is often based on mutual agreement of both parties, it does not require the involvement of public authorities in decision-making at specific events. This type of cooperation appears to be effective and proportionate to local and regional needs. This cooperation may have its own institutional structure. An example of such cooperation could be a purposefully established European Grouping of Territorial Cooperation or a Euroregion, such as the Euroregion Enschede-Munster (NL-DE-B), within which, among other things, systemic cross-border cooperation operates for rescue helicopters for the border area of all three states. This cooperation was gradually supplemented by cross-border crisis plans of border municipalities, which thus introduced a multi-governance model in the area of IRS operation (Princen, 2014).

3. Cooperation within the informal request for cross-border assistance - based primarily on the cooperation of local communities without the specification of methodologies and rules (most often voluntary fire brigades). This cooperation does not require the boundaries of complex formal procedures for joint intervention / intervention on the other hand, but carries additional risks due to the absence of rules (eg causing damage, missing rules for commanding interventions, etc.).

An important aspect is the anchoring of cross-border cooperation in the institutional management of self-government at the national level. This cooperation is voluntary, it does not replace the performance of public administration in a given article, but complements or supports it (Haughton, 2009). Cross-border cooperation is usually implemented within a kind of hybrid model of parallel functioning with self-governing bodies on both sides of the border. European territorial cooperation is increasingly promoted in current European policies as an integrated use of the potential of cross-border cooperation (Ahner / Fuchtner 2010). Within the Schengen area, in the process of European integration and globalization, the so-called "reterritorialization" is intensifying, where the administrative boundaries of territorial units are losing importance at the expense of creating functional cross-border regions based on social, economic and cultural ties (Princen, 2014). Within academic considerations, this process is referred to as 'cross-border regionalization', where social and economic links take place within cross-border legal entities such as Euroregions, EGTCs, eurocities, cross-border commissions, etc. Mederios, 2019). Joachim Beck proposed the differentiation of six levels of cross-border cooperation, as an extension and extension of the scope within the so-called multilevel self-government / regional management (Beck 2017). These levels of cooperation are interlinked and are based primarily on meetings of local and regional representatives for the free exchange of information and mutual learning. The next phase is the regular exchange of information, followed by the coordination of approach and local policies. The following three levels fundamentally overlap with the legal competencies of municipalities or regional self-governments. Here, joint strategic planning takes place in order to ensure coordinated and integrated approaches, which are at the heart of

joint decisions. The last level of cooperation is the joint implementation of tasks, including the organization and provision of local public services (Beck, 2017). This model creates a new functional dimension for territorial cohesion and regional development, which complements ensuring the functioning of self-government in a given area. As an example of institutional tools for the implementation of steps 4-6, it is necessary to mention European groupings of territorial cooperation or Euroregions.

Compared to national cooperation within the IRS, cross-border cooperation is characterized by a greater need to invest time and resources, both for the initiation of this cooperation and for its subsequent maintenance and development. The main barriers include removing barriers associated with different legal systems and cultural or linguistic differences. The main advantages of cross-border cooperation in the field of IRS, especially in less populated border areas, include the possibility of sharing resources and infrastructure with a neighboring municipality / region (Princen, 2014). This can be considered as an organizational advantage that leads to a reduction in travel time, and at the same time is more economically efficient in terms of construction and use of infrastructure. The ability to act and readiness to intervene, given the incidental and accidental nature of crisis and emergency situations, is very difficult to quantify financially. Statistical data of the so-called protected values, which represent theoretical damage, in case of non-intervention by the IRS units (Ministry of the Interior of the Czech Republic, 2020) can serve as a guide to this. These data are partly included in the economic models developed in this research. However, data on the values of health and saved lives with financial expression, which are mainly used by health and commercial insurance companies, are not included here.

Based on existing research and professional literature, it can be stated that cross-border cooperation in the field of IRS usually has a local and regional dimension. The most frequently identified barrier is the legal aspects, which at the same time often serve to determine clear rules and define the scope of competence for joint action over national systems. Another important statement is that the motivation for cross-border cooperation is almost never economy or efficiency, but a willingness to develop cooperation, political decision-making, organizational or geographical aspects. In the current literature, economic analyses and comparisons of ensuring the functioning of basic security through the construction of the necessary infrastructures and their operation against the model of ensuring this within cross-border cooperation are not available. According to the analysis of available data (KEEP Interact), it can be stated that such cooperation is most often financially covered from external sources, such as cross-border cooperation programs or bilateral grant titles. This cooperation of the IRS is implemented in addition to the current local budgets (eg from the chapter for ensuring fire protection or public order) and requires above-standard equipment compared to ensuring security only on its side of the border. Given the accelerating integration processes within the EU, increasing the intensity of cross-border IRS cooperation across Europe (KEEP, 2020), deteriorating public budgets in the COVID crisis, economic and financial aspects will become important as one of the motivations for initiating such cooperation within the organization and provision of local public services in peripheral border areas. Based on empirical research of four case studies of IRS cooperation, Princen stated that one of the most important factors influencing cross-border IRS cooperation is the human and professional factor. The intensity, form of cooperation and cross-border interconnection of individual components of the IRS depend on the willingness and ability of professional compromises in the standards of providing assistance to individual actors of this cooperation. Often the reluctance to find compromise solutions in different procedures on both sides of the border leads to the ineffectiveness of this cooperation, which remains purely formal. Confidence that cross-border cooperation will lead to the achievement of the planned objectives is the basis of this cooperation. Another factor is the ability to link different national systems, which have different competencies and organizational models so that in the case of cross-border intervention are able to intervene effectively in terms of time, respectively. so that sending troops across borders does not require lengthy administrative processes.

Given the sharp increase in the intensity of cross-border cooperation in the provision and organization of local public services, which have hitherto been the exclusive competence of national self-governments, it is an important aspect to ensure effective financing of this cooperation from public budgets. In particular, it is a systematic and stable provision of funding for those local public services that have a cross-border dimension based on functional cross-border links. The provision of these services requires the creation of an appropriate infrastructure, suitably trained staff on both sides of the border and, last but not least, political will.

3. Methodology and data

For the purposes of this paper, the chose reference area of the north part of Olomouc region in the Czech Republic, as it meets the preconditions for the provision of cross-border public services at the local level. The northern part of the Olomouc Region (Jeseník and Šumperk districts, a total of 102 municipalities) immediately adjacent to the Opole Region (PL) was chosen. It is a locality with a very long travel time to the center of the region (geographical obstacle – foothills of Jesenik), low population density, which makes it significantly difficult to ensure sufficient coverage by inland fire protection. Table 1 show basic data about both included districts.

	Jeseník District	**Šumperk District**
Area	719 km² (33% out of area are forests)	1 313,06 km²
Population	37 968	120 417
Population density	52,8	91,7
Border length with Poland	101 km	17 km
Are the Czech municipalities destined for cross-border fire protection coverage in the region's alarm plans?	YES	NO
Basic land characteristics	transport infrastructure mainly of local character, geographical obstacles - mountainous terrain, irregular and less dense population, mostly small villages.	well-developed main transport infrastructure, good interior transport accessibility, small geographical barriers, larger concentrations of urban areas.

Tab. 1 - Basic data of research area, own processing, CZSO, 2020.

The following data were collected for the purposes of this paper:

1. Data on inland and cross-border interventions incl. Time, type, length to intervention and location data, financial data for interventions incl. Protected values, financial data for the operation of fire brigades, etc. - period 2015-19.

2. Data concerning the socio-geographical conditions of the territory.

3. Municipal budgets incl. Fire protection expenditure.

4. GIS data associated with area (interior and cross-border) and road infrastructure. The data take into account real driving time, including road infrastructure and border crossings points.

5. Data and outputs of the "Safe Borders" project.

The research part deals with 2 districts along the Czech-Polish border, on the territory of which there are various geographical, infrastructural and institutional obstacles. Within this contribution, over 14,000 records from firefighters' interventions were processed, divided into cross-border and national levels for the period 2015-19. The data obtained in cooperation with the Regional Directorate of the Fire and Rescue Service contained information on the arrival time for the place of intervention, the duration and type of intervention, the participating units, etc. After data processing, set theory and structuring were used. As part of data processing, a division was made according to the distance of individual municipalities from the border and the location of professional firefighters. Subsequently, based on GIS maps, an analysis of travel times in relation to the nature

and type of interventions was performed. these data were compared between cross-border bailouts in relation to inland interventions.

The identification of the main factors influencing the motivation and implementation of multilevel management for cross-border cooperation in the field of fire protection was based on the analysis of the flagship project "Safe Border" implemented in frame of Interreg VA Czech Republic - Poland (implementers: five regional Regional Directorate of Professional Firefighters along the State Border on Czech side and three on Polish side). Furthermore, using mathematical-statistical methods, data on national and cross-border interventions were processed and correlations of data related to municipal budgets for fire protection in relation to socio-geographical conditions were performed. The purpose of this part of the research was to verify the impact of the above municipal expenditures on fire protection in relation to their peripheral location, population density and area.

4. Research and discussion

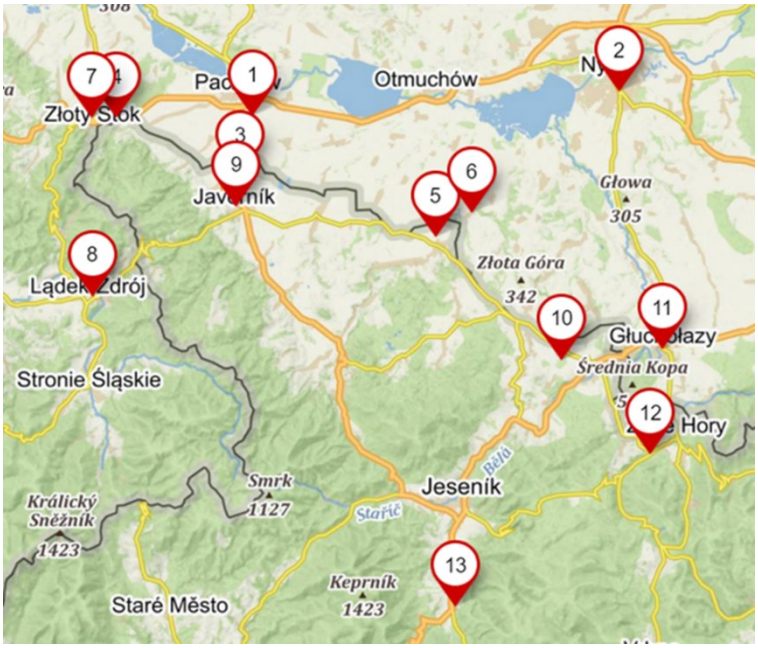
Mutual assistance in emergencies and disasters between the Czech Republic and the Republic of Poland is governed by an international agreement.
In the case of cross-border assistance, the basic scope of assistance is elaborated in the so-called Rescue Plan. The Rescue Plan regulates the forces and resources that are predestined for deployment to a neighbouring region or voivodship with regard to the type and extent of the emergency.
Based on the processed data for interventions in the period 2014-19 in the framework of cross-border cooperation in the field of fire protection, it can be divided into **three groups**:

1. necessary assistance, where units on the other side of the border are faster at the scene than national units due to better accessibility,

2. assistance from units on the other side of the border for capacity reasons, eg in the event of large-scale forest fires or floods, where a longer intervention period needs to be ensured,

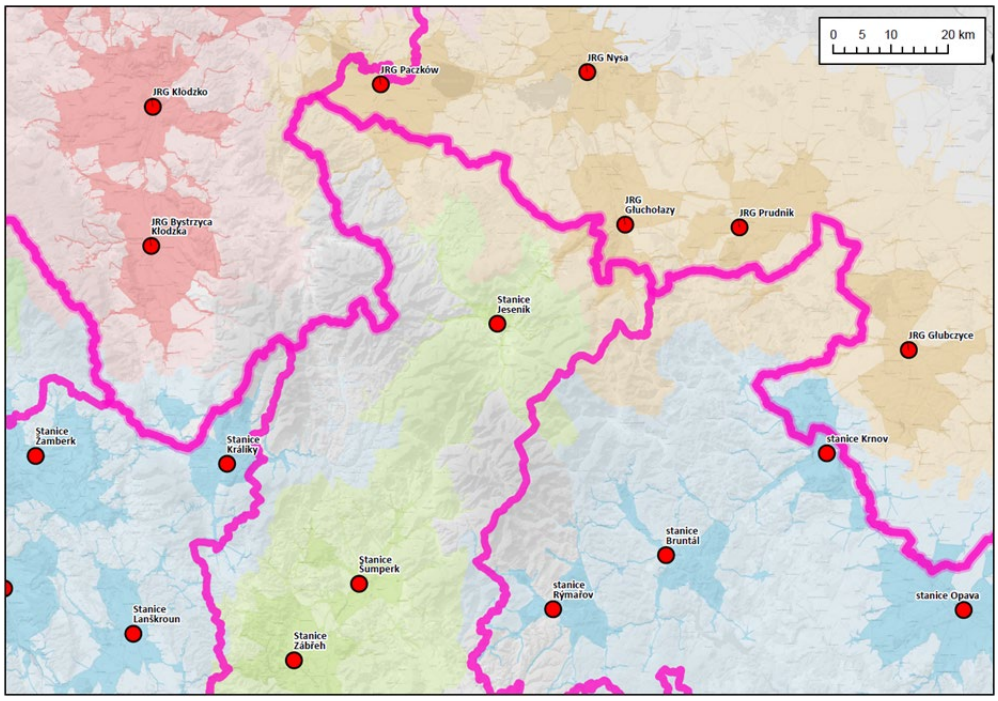
3. highly specialized interventions, where atypical equipment of units is needed, eg chemical interventions, rescue from water, etc.

The first two groups of interventions are mainly related to geographical conditions and the density of the road network, incl. border crossings. It can be stated that these two types of cross-border assistance work on both sides and occur in municipalities in the immediate vicinity of the border (eg Zlaté hory, Mikulovice, Bílá Voda, etc. The interventions of the third group are less numerous and are not associated eg Nysa, Bělá pod Pradědem) - see map 1). The duration of these interventions is more time consuming than the first two groups, and therefore more costly.



Map 1 – location of firebrigads (PL) for crossborder interventions, places of interventions (CZ). Own processing, source of data: KR HZS, OL kraj, 2020.

The analysis of the available data revealed that cross-border cooperation in the field of fire protection is complementary. At present, the Olomouc Region, within the framework of the valid Rescue Plans, a part of the Czech territory is also covered, to varying degrees, by the activities of Polish fire protection stations. This applies to the village in the Jesenik district. The district of Šumperk does not count on this assistance due to the shorter length of the common state border and the small number of border crossings' points. This is reflected in statistics showing that cross-border assistance does not work in this district. Based on available data and analysis of GIS maps, it can be stated that this is associated with good availability of fire protection within the hinterland and another type of settlement structure (the level of settlement concentration). Here it can be stated that the factor that affects the effectiveness of possible cross-border cooperation are unfavourable for this cooperation geographical conditions, incl. low densities of the cross-border road network (or the length of the range of Polish units is disproportionately long compared to the range of units from the interior, see the GIS – see map 2). The opposite case can be observed in the case of the Jeseník district, where the arrival time of Polish units in the case of border villages is in many cases shorter than units from the interior.



Map 2 – range of fire brigades within cross-border travel time. Source of data: KR HZS, OL kraj, 2020, processing by KR HZS, OL kraj, 2020.

According to the current principles of compiling fire protection plans, the key factors were population density, where the level of the indicator proportionally increased the risk of emergencies. Furthermore, within the identification of the degree of risk, all unit elements are evaluated, which can increase the common risk by leaps and bounds, eg the existence of chemical plants in the area, transport corridor, increased incidence of tourists, etc. fires alone account for only 14% of all firefighting interventions. It can be stated that the share of interventions related to natural disasters and elimination of negative impacts of climate change is growing in relation to the total number of trips (eg removal of fallen trees, forest fires, flash floods, etc.), ie they are not events directly related to human activity.

Another significant factor is the cost and effectiveness associated with providing fire protection in relation to the protected area and population. Based on the collected financial data related to the expenditures of municipalities on fire protection in the subject area, the correlation between these expenditures and the location and size of the population was calculated using regression models. In financial terms, ie the relationship between municipal expenditure on fire protection (Source: Monitor, own data processing) and population density is high (,468). However, the correlation between expenditures and the area of the protected area shows a positive correlation (,249). these results point to the fact that there is still a higher correlation between the risk of an emergency caused by human activity (the higher the population density at this risk level) than the impacts of climate and natural change. The slight difference in the value of both coefficients confirms the change in the structure of the type of interventions, which are, according to the annual report of DG of HZS 2019, the more I aim to eliminate the negative impact of climate change.

Another part of the research was a financial analysis of real costs associated with the operation of both models of fire protection, ie: construction of another station of professional firefighters in the immediate vicinity of the border or providing basic fire protection in border municipalities with volunteer fire brigades with cross-border assistance. As part of the processing of the collected data, a cost analysis was subsequently performed in a comparative view of ensuring professional inland fire protection in relation to the implementation of fire protection in the voluntary fire brigades model, supplemented by cross-border assistance. The cost analysis was performed using data obtained in cooperation with the Regional Fire Brigade of the Olomouc Region, data available from the cross-border cooperation project "Safe Border" and information on fire protection costs to the municipality.

For the model of inland fire protection, the costs of construction and operation of an additional professional fire station in the 5 + 1 model are taken into account. In the model of volunteer firefighters by providing the municipality supplemented by the assistance of Polish fire brigades, the costs of construction and operation of the volunteer fire brigade are taken into account, costs of Polish fire brigades' interventions recalculated at hourly rate, additional language and expertise readiness for cross-border interventions These data were processed on the basis of data for the period 2015-19 (see Table 4).

Type of costs	**Professional fire brigade – construction and operation of new fire station (for 5 years period of operation)**	**Construction one additional fire station of voluntary fire brigade with additional cross-border cooperation (for 5 years period of operation of 5 stations in borderland for cover same area)**
Total cost of construction and operation of fire brigade incl. equipment and personal costs	46 660 250CZK	15 925 000CZK
Additional training costs (language and professional training of 18 firefighters on the other side of border)	0CZK	365 000CZK
Historically costs of 61 interventions with cross-border support (according to the duration of interventions/hourly rate)		490 000CZK
Total costs	**46 660 250CZK**	**16 780 000CZK**
Total number of intervention 2015-2019 in borderland	1664	61 with cross-border support, 965 only national in these municipalities
Total protected value for all intervention 2015-19	**117 351 000CZK**	**230 981 000CZK, incl. 25 640 000CZK (with cross-border support)**

Tab. 4 – review of costs for professional and voluntary fire brigades, own processing. Source of data: KR HZS, OL kraj, 2020, processing by KR HZS, OL kraj, 2020.

In the model of construction and five-year operation of an additional fire station of volunteer firefighters in the immediate vicinity of the border and cross-border, operation of 5 existing fire brigades of voluntary firefighters with support of professional corps from the Polish side, this cooperation appears to be more effective than establish new professional fire brigades. However, it should be pointed out that this is primarily the first group of interventions, where the key is the travel time. From the obtained data it is not possible to state whether in the case of complex interventions, where special equipment is required, such cooperation would replace the operation of professional fire brigades. In the case of Jeseník district, this cooperation will reduce the negative impacts of the geographical nature of the landscape (mountains, watercourses, etc.) and lower density of the road network.

Conclusions

The main factors influencing the effectiveness of providing and organizing fire protection in border regions are mainly geographical factors, the density of the road network, which negatively affects travel time, availability of fire brigades on the other side of the border and factors affecting the risk of emergencies, ie population density,

area forests, watercourses or human activities (industrial, transport, etc.). The example of the Jeseník and Šumperk districts shows a difference in the intensity of the occurrence of the above-mentioned factors, which is reflected in the intensity and need for cross-border assistance in order to ensure basic fire protection. Other factors that may influence the initiation and functioning of cross-border cooperation, as mentioned by Princen, are the motivation and willingness to cooperate with the main actors of decision-making at the local and regional level. These aspects will be the subject of further research. Based on the financial analysis, it can be stated that the cost of an additional station for professional firefighters in the immediate vicinity of the border would be much more expensive than ensuring the functioning of a mixed model of volunteer firefighters with support from units on the other side of the border. Furthermore, it can be stated that the effectiveness of the alternative model is sufficient in relation to the value of protected values. However, these protected values are higher than five years of operation and the establishment of a professional fire brigade station. In the case of the Jeseník district, this situation is associated with the deployment of professional fire brigade units in Jeseník, which divides the significant travel time to border villages (especially Zlaté hory, Javorníka, Bílá Voda, etc.). The deployment of professional fire brigades is based on the calculation of the level of risk in the area.

References

[1] Ahner, D., Fuechtner, N. (2010). Territoriale Kohäsion: EU-Politik im Dienste regionaler Potenziale. *Informationen zur Raumentwicklung*, Heft 8, 2010. 543 – 552.

[2] Allmendinger P., Haughton G. (2009). Soft spaces, fuzzy boundaries, and metagovernance: the new spatial planning in the Thames Gateway. *Environment and Planning*, *A 41(3)*. 617–633.

[3] Beck, J. (2018). Cross-Border Cooperation: Challenges and Perspectives for the Horizontal Dimension of European Integration. *Administrative consulting*. 56-62.

[4] Bel, G., X. Fageda, Mur, M. (2014). Does Cooperation Reduce Service Delivery Costs? Evidence from Residential Solid Waste Services. *Journal of Public Administration Research and Theory 24 (1)*. 85–107.

[5] Bel, G., Warner, M. (2015). Inter-municipal and costs: Expectations and evidence. *Public Administration,* vol. 93. 52-67.

[6] Bel, G., Warner, M. E. (2016). Factors Explaining Inter-Municipal Cooperation in Service Delivery: A Meta-Regression Analysis. *Journal of Economic Policy Reform* 19 (2). 91–115.

[7] Bénard, J. (1990). *Veřejná ekonomie 1*. Praha: EU ČSAV.

[8] CESTR, M. (2014). *Česko-polská přeshraniční spolupráce ve vybrané části euroregionů Praděd a Silesia* (Diplomová práce). UPOL Olomouc, 2014. Dostupné z: <https://theses.cz/id/8kcwa4/>.

[9] Český statistický úřad. (2020). Data dostupné z: www.czsu.cz.

[10] ESPON. (2019a). *Cross-border public services in Europe*. Final Report. Luxembourg: ESPON. Dostupné z: https://www.espon.eu/CPS.

[11] ESPON. (2019b). *Cross-border public services (CPS) Targeted analysis Final report Scientific report – Annex XI case study report – Alentejo-Extremadura-Andalucia*. Luxembourg: ESPON. Dostupné z: https://www.espon.eu/CPS.

[12] Evropský parlament. (2020). Data dostupné z: https://www.europarl.europa.eu/factsheets/cs/sheet/98/evropska-uzemni-spoluprace.

[13] Gabryšová, M., Ciechomski, W. (2019). The Role of Crisis Management in the Functioning of Border Regions. *Zeszyty Naukowe. Organizacja i Zarządzanie/Politechnika Śląska*, č. 139 - Competitiveness and Development of Regions in the Context of European Integration and Globalization. State-Trends-Strategies). 123-137.

[14] Grabmüllerová, D. (2009). Územní soudržnost. *Urbanismus a územní rozvoj, ročník XII,* 7.

[15] Jaldell, H. (2019). Measuring productive performance using binary and ordinal output variables: the case of the Swedish fire and rescue services. *International Journal of Production Research*, *57*(3), 907-917.

[16] Jaldell, H. (2018). Measuring productive performance using binary and ordinal output variables: the case of the Swedish fire and rescue services. *International Journal of Production Research.* 1-11.

[17] Krasuski, A., Kreński, K., & Łazowy, S. (2012). A method for estimating the efficiency of commanding in the State Fire Service of Poland. *Fire technology*, *48*(4), 795-805.

[18] Lotter, A., Brauner, F., Gabriel, A., Fiedrich, F., Martini, S. (2017). New Decision-Support Framework for Strengthening Disaster Resilience in Cross-Border Areas. Dostupné z: http://idl.iscram.org/files/andreaslotter/2017/2030_AndreasLotter_etal2017.pdf.

[19] Medeiros, E. (2014). Barrier effect and cross-border cooperation: Sweden-Norway INTERREG. A territorial effects. *Finisterra*, *XLIX*(98). 87–100.

[20] Medeiros, E., Guillermo Ramírez M., Ocskay G., Peyrony, J. (2020) Covidfencing effects on cross-border deterritorialism: the case of Europe. *European Planning Studies*. 1-21.

[21] Molak, M., Huk, M. (2012). *The Emergence of Cross-Border Functional Areas - Evaluation Study: Evaluation study on the territorial dimension of cohesion policy - the emergence of cross-border functional areas*. Berlin: LAP.

[22] Princen S, Geuijen K, Candel J, Folgerts O, Hooijer R. (2016). Establishing cross-border co-operation between professional organizations: Police, fire brigades and emergency health services in Dutch border regions. *European Urban and Regional Studies*, *23(3)*. 497-512.

[23] Provazníková, R. (2015). *Financování měst, obcí a regionů. Teorie a praxe.* 3. vyd. Praha: Grada. 11-73.

[24] Soukopová, J. (2016). Meziobecní spolupráce jako faktor nákladové efektivnosti a odpadového hospodářství. *Sborník příspěvků - XIX. Mezinárodní kolokvium o regionálních vědách*. Brno. Masarykova univerzita. 753-759.

[25] Soukopová, J., Vaceková, G. (2018) Internal Factors of Intermunicipal Cooperation: What matters most and why? *Local Government Studies*, *44(1)*, 105-126.

[26] Soukopová, J., Vaceková, G. & Klimovský, D. (2017) Local waste management in the Czech Republic: Limits and merits of public-private partnership and contracting out. *Utilities Policy*, *2017(48)*, 201-209

[27] Warner, M., Clifton J., (2014). Marketization, Public Services and the City: The Potential for Polanyian Counter Movements. *Cambridge Journal of Regions, Economy and Society, vol. 7(1)*. 45-61.

[28] Warner, M., (2014). Municipal size, Resources and Effeciency: Theoretical Bases for Shared Services and Consolidation. *Municipal Shared Services and Consolidation.* Newark: Routledge. 3-16.

[29] *Zákon o obcích, 128/2000 Sb., ve znění pozdějších předpisů, vč. novelizace 99/2017 Sb.*