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Research article

A Systematic Collaboration of Volunteer and Professional Fire Units in Hungary

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Abstract: Volunteer firefighter units provide fire protection and rescue in many countries, while efforts to ensure safety often fall under the competencies of municipalities and local communities. Hungary, a Central European country centralised a large portion of its public services in the past decade, fire safety and rescue became the competence of a centralised professional governmental agency with national coverage. Although policy builds on a central professional organisation, the volunteer firefighting movement gained importance and has grown significantly recently. This paper investigates the collaboration between private volunteer firefighting brigades (local associations) and the central governmental disaster management agency of Hungary. We apply a case study approach to understand how volunteer units are integrated into the professional system. Our research is based on the analysis of policy documents, key informant interviews and Freedom of Information data requests. Findings show that volunteer units contribute to the safety and resilience of local communities in Hungary, but their engagement is not sustainable due to demographic and societal challenges, as well as the policy contradictions identified. The majority of the research on the role of volunteer firefighters covers decentralized countries with subsidiary systems. This current case study provides an addition to the discourse around the involvement of volunteers in fire safety with the evaluation of a collaboration between a centralized professional authority and localized, individual volunteer fire associations.

Keywords: volunteer firefighters, collaboration, fire safety partnership, Emergency Management Policies, first responders

1. Introduction

Although the formalisation of disaster management increased in the past decades and actors became more professionalised, a large portion of work still remains in the hands of volunteers (Montano, 2020). Volunteer firefighters play a crucial role in fire protection all across the globe. According to the latest worldwide statistics on fire brigades, out of the 15,4 million firefighters, 13,9 million people volunteer to provide life- and value-saving services (Brushlinsky et al., 2020). In recent years, Hungary has developed a centralised and professional public body to guarantee the safety of its citizens. The National Disaster Management Authority integrates fire and rescue services, civil protection and industrial safety in its three operating pillars. According to the national legislation, fire protection and technical rescue are state responsibility (Muhoray, 2012).

Hungarian public administration has seen a profound re-centralisation of power in the past 15 years, which has been accelerated since 2010 (Kovács, 2014). Services formerly provided by local governments to their citizens, including but not limited to housing, education, healthcare and parts of social welfare became the competence of central governmental agencies (Gellén, 2012; Pálné Kovács,

2016). Formerly, firefighting and technical rescue operations were municipal competencies, but in line with the new constitution accepted in 2011, a central governmental agency was established at the beginning of 2012, integrating firefighting, civil protection and industrial safety (Muhoray, 2012). The main objective of the Ministry of Interior's National Directorate General for Disaster Management (NDGDM) is to prevent disasters, to protect the life- and property of the Hungarian population, and ensure the safe operation of critical infrastructures and the overall economy (Teknős, 2019). To fulfil these legislative obligations, the overall territory of the country is covered by the operational territories of professional fire services belonging to NDGDM (Tóth and Tímár, 2016a).

Although national legislation (Act CXXVIII of 2011) defines fire and technical rescue activities as a national responsibility, the past 8 years have shown a significant development in local volunteer firefighter capacities. Their headcount and engagement has grown dramatically since 2012 (Bérczi, 2020). In Hungary, volunteer fire brigades are categorised as self-organising private associations (local NGOs) with dedicated tasks related to fire safety and rescue in their statutes (Urbán, 2019). As will be shown in this current article, the recently established system extended the responsibilities and competencies of the volunteer brigades as local civil society actors. Despite the clear systematic motivation to include additional resources, establishing of further understanding of the efficacy of this system is necessary, especially to deepen the understanding of the practical implementation of cooperation between professional units, as assets tied to authorities, and volunteer associations (Cvetković, 2019; Cvetkovic & Martinovic, 2020; Cvetković et al., 2022; Carla, 2019; Cruz & Ormila, 2022). The article aims to provide empirical evidence on how civil society involvement can be established in a centralized country, meanwhile to identifying policy gaps constraining the full potential of these collaborations (Xuesong et al., 2019; Kumiko & Shaw, 2019). The paper investigates the nature of the collaboration between private volunteers and public professional fire units, focusing on factors stimulating the development of such cooperation as well as systems and functions supporting it.

This paper is structured as follows. After the introduction, we summarise the relevance of public-private partnership in firefighting, then we explain the methodology we applied and present the data sources of our study. We divided our results into subsections detailing the policy of responding to volunteer fire brigades, their engagement and motivation, the administrative aspects and the information and communication technologies involved. At the end of this paper, we discuss the possible way forward regarding policy development and future research and conclude our findings.

2. Public-private collaboration in fire safety and rescue

Safety is a public good (Székely, Somody and Szabó, 2017), and fire safety can be considered as a special form of public services (Jääskeläinen and Lönnqvist, 2011). Collaborations between professionals and volunteers in fire safety are especially important in case of vulnerable communities (Halvorsen, Almklov and Gj, 2017), and hard-to-reach rural areas (Ramsell, Pilemalm and Granberg, 2017). Effective cooperation with non-governmental actors during disasters, and their integration into the respective national response system has been an ongoing theme in the Central-European regional risk management discourse (Dostál, 2015).

Although governments have their main responsibility to provide safety and security to their citizens, there's an increasing recognition that the public sector apparatus is unable to deal alone with wicked policy problems, such as climate change, safety and security issues (Lægreid et al., 2014). Crisis events are typically complex situations involving multi-level and multi-sectoral actors when public organisations need to work across their existing organisational boundaries and collaborate with their stakeholders (Christensen, Lægreid and Rykkja, 2019).

By the definition of Lindblom (1965), coordination is a systematic relationship between decisions in order to reach positive outcomes for the participants and to avoid negative consequences (Lindblom, 1965). Coordination is deliberate intervention if it leads the participants to recognize their mutual dependencies, followed by arrangements to shape their decisions (Tuite, 1972). Interorganizational relationships can be formalized, but a large number of them happen as short-term, ad-hoc efforts to overcome an urgent issue (van de Ven and Walker, 1984).

Organizations involved in the resolution of complex and unexpected situations need to implement strategies for collective action (Weick and Sutcliffe, 2007). Relief organizations and scholars of disaster management often use the phrases cooperation and collaboration interchangeably (Balcik et al., 2010), but major literature on collaboration theory presents the phenomenon more as a contin-

uum. According to Kamensky et al. (2004), the collaboration continuum has two ends, coordination and cooperation represent a more distant connection, and networks and partnerships describe a closer joint approach (Kamensky, Burlin and Abramson, 2004). Collaborative public services (including public safety) have extensive contemporary literature. While collaborations take different forms across time periods and geographical locations, scholars also employ different definitions (Batory and Svensson, 2020).

According to Kamensky et al (2004), "collaboration occurs when people from different organizations produce something together through joint effort, resources, and decision-making, and share ownership of the final product or service" (Kamensky, Burlin and Abramson, 2004, p. 8). Focusing more on public services, Ansell and Gash phrase it as "[a] governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or asset" (Ansell and Gash, 2007, p. 544). Another definition highlights the main driving force for collaboration, the limitations of the standalone organizations, and phrases the concept of collaborative public management as the „process of facilitating and operating in a multi-organizational arrangement to remedy problems that cannot be solved — or solved easily— by single organizations" (Mcguire, 2006, p. 33). In the scope of our current study, we emphasize that the relationship between volunteer and professional units in firefighting is on the collaboration end of the cooperation-collaboration continuum described by Kamensky et al. (2004).

This collaboration has special particularities as firefighting is a skill-based activity, involving largely dedicated and specifically trained personnel. Firefighters have to build knowledge, physical fitness, and mental strength to overcome dangerous situations. While professional firefighters carry out training and services as their day-to-day job with a salary, volunteer firefighters take part in these at the expense of their leisure time (Guidotti et al., 2016). Volunteer firefighters occupy a deep part in the local public life, providing a wide range of societal services that help to strengthen the cohesion of the community (Brunet, DeBoer and McNamara, 2001). Unity and heritage are important for volunteer fire brigades, and they are often important parts of the local history (Simpson, 1996).

In a decentralised, subsidiary-based system, local governments can choose to operate a professional or a volunteer fire brigade. According to Brunet et al. (2001), maintaining a volunteer fire brigade is more beneficial and rational in areas with rural areas covering a lower economic aggregate. The absence of high-rise buildings and dangerous industrial facilities makes the need for specialised training and special equipment lower, and longer alert time acceptable (Brunet, DeBoer and McNamara, 2001). This paper contributes to the current state of knowledge in public policy related to the management of risks and hazards with a case study from a centralised state.

3. Methods

Hungary is a highly centralised state (Ágh, 2013), where fire safety and technical rescue are the responsibility of a dedicated central national agency. This paper investigates how volunteer assets can be utilised in a centralised professional fire and rescue structure. During our work, we emphasize the nature of the collaboration, as well as on the different Information and Communication Technologies assisting it. We also aim to identify obstacles, niches and good practices from this case.

The current research follows the case study methodology (Stake, 2000; Schwandt and Gates, 2018). We chose case study methods as they focus on in-depth factors and can be used to investigate a phenomenon in its real-world context (Su, 2018). The paper utilises information from three main sources. We conducted desk research covering legislative and policy documents, to identify the formal structures and responsibilities within the collaboration. After establishing an understanding on the actors and responsibilities, we organised interviews with competent key informants, which has been supplemented with a connecting public data request under the Hungarian Freedom of Information legislation from the relevant authorities. At the beginning of the interviews, we asked the participants to describe the collaboration and summarize how it has been developed. Further questions covered the different practicalities of the collaboration, including administrative obligations, red tape, Information Communication Technology (ICT), financial background, possible gaps and further developments. The interviews were held as semi-structured discussions giving the opportunity to the participants to introduce topics broader than the list of questions. Researchers conducted the interview and followed up on issues raised with further questions, capturing the different aspects of the collaboration. The current case study was part of a broader research initiative focusing

on the aspects of Red Tape and ICT in public collaboration, therefore aims to identify how Red Tape affects the efficacy of the collaboration, and how ICT solutions support it. Analysis of these is mainly based on the opinions and experiences of the participants and their perception of them as matter experts. Follow-up phone calls were carried out with the respondents in autumn 2022 to see if their opinions had changed since the interviews in 2019. During this, respondents indicated no deviation, except the issue of rising energy prices and more scarcity of financial resources.

Throughout the research, the anonymity of the informants was ensured, except for the high-level informants who represented their office. Interviews were held in Hungarian, except one in English. Discussions were recorded, and the content of interviews was captured in English summaries. This research received approval from the Central European University's Ethical Research Committee under the reference number 2017-2018/9/EX. Requirements of research ethics and data protection were observed and followed throughout this research, including informed consent by the participants.

4. Data

Data collection took place between November 2019 and April 2021. During desk research, collected documents included relevant legislation and public administration orders, as well as existing academic and historical literature about the role of Hungarian volunteer firefighters. During the data collection period, there were no changes in legislation nor in the practical implementation of relevant regulations.

Interviews were organised either at the premises of CEU or the informant's venue. Discussions were semi-structured with open-ended questions to discover the history, the structure and the nature of the collaboration. Interviews were organized between November 2019 and September 2020. COVID-19 pandemic response restrained our access to informants, but the selection of respondents was done to have broader coverage – please note that key decision-making personnel and advocacy representatives with umbrella roles were also included.

Quantitative data are also used to support our research aims. We gained access to statistical information related to volunteer brigades through a Freedom of Information request to the proper authorities. Accessed data include information on the number and territorial location of volunteer brigades, as well as their headcount and level of competences. We received information covering the number of annual turnouts, disaggregated on individual or cooperative responses.

Table 1. List of informants and their background.

Code	Details
WP9-01	A professional firefighter officer with more than 15 years of experience, working closely with volunteer fire brigades. The informant has responsibilities in the professional supervision of their activities, including equipment and readiness inspections, as well as on-site commanding during major incidents and fires.
WP9-02	Professional firefighter general, president of Hungarian Firefighters' Association. Holds degrees in pedagogy and emergency-management. A central actor in the development of the emergency services in the '90s and 2000s. The Hungarian Fire Association is an umbrella NGO of the local Fire Brigade Associations, advocating on behalf of the non-professional fire assets of the country.
WP9-03	A high-level commanding officer of the Disaster Management agency with more than 30 years experience in firefighting. Both professional and volunteer assets are under the coordination of his organisational unit in a county area.
WP9-04	The National Inspector General for Fire Protection. He has 26 years of experience in firefighting with 20 years in leadership roles on different levels. Previously oversaw the national reform of the fire services, including the emerging role of volunteer brigades. As a scholar, he has a strong research interest in the development of fire protection and volunteer assets.
WP9-05	Leader of a responding volunteer fire brigade in the outskirts of Budapest. His fire brigade has a long history in his village, majority of the village burnt down in the 19th century. The Volunteer Fire Brigade of the village was one of the first re-established after the fall of socialism, and one of the first that gained responding status in 2014. The brigade has strong support both from the municipality and the local individuals and business.

WP9-06	Leader of a recently (past 5 years) established cooperating volunteer fire brigade located in a county capital. Experienced in volunteering for disaster management activities.

5. Results

The chapter follows the structure detailed below. First, we show the extent and relevance of volunteer units in the Hungarian response system based on statistics and literature analysis. We begin with the establishment of the new collaboration and then explain it in detail. After establishing a deep understanding of the system of collaboration, we investigate the importance of motivation and the solid financial background of the brigades, which is followed by the administrative burden and the role of ICT solutions.

5.1. Introducing a new system for on-site collaboration with volunteer first responders

According to all interviewees, volunteer firefighting units are a necessary part of the current fire and rescue system in Hungary. The introduction of the "responding volunteer fire brigades" (RVFB) in 2014 was a major step in extending the responsibilities and competencies of voluntary actors, which was praised both by the representatives of the public bodies and the volunteers themselves. Up until then, volunteer fire brigades had a cooperating and ancillary function, meaning that each incident had to be attended by a professional unit, even if the local voluntary capacities were sufficient to deal with the incident. The policy reform offered a new relationship with the introduction of written cooperation agreements and different support schemes. One of the main consequences was a substantial increase in the number of volunteer fire brigades in Hungary (fig.1), leading in 2014 to the introduction of a new administrative and operational status: the "responding volunteer brigades".

Figure 1. Number of volunteer fire brigades in Hungary. Source: Bérczi (2020) and Freedom of Information data request

As mentioned, before the reforms volunteer brigades were only allowed as additional assets, and a professional unit had to attend to each incident and take control of the situation. According to informants of this study, this was often inefficient as many volunteer groups had the ability and the resources to extinguish smaller fires and carry out rescue activities on their own. (WP9-04). The introduction of "responding volunteer brigades" acknowledged the autonomous potential of this group. If there is a sufficient headcount, volunteers are trained, there is a fire engine vehicle with certified equipment, and other administrative requirements are fulfilled, then the volunteer brigades can elevate their status from additional cooperating assets to first responders. In practical terms, this means that they must provide a minimum of 3000 hours of on-call service when they can be alerted and dispatched immediately to attend incidents via instructions from the central operation room.

Table 2. Number of Responding Volunteer Fire Brigades (RVFB) and their on-duty service hours. Source: NDGDM – Freedom of Information data request

	2014	2015	2016	2017	2018	2019	2020
Number of RVFB	12	22	37	44	49	55	58
On duty (hrs)	28,500	69,125	135,125	167,000	179,750	202,000	211,375

The new status brings more than just additional responsibilities. If brigades satisfy the minimum requirement of 3,000 hours on-duty time per annum, they receive monthly support for their operations (~262,5 EUR/month, 447 EUR after 4500 hours per year) covering utility and other costs, and they are also given priority in calls for proposals for training and in-kind support (equipment).

According to the information we received for our public data request, out of the 654 volunteer brigade associations across the country, by November 2020, 58 groups took up this responsibility and opportunity. The remaining 599 volunteer fire brigades continued to provide additional response assets as cooperating volunteer fire brigades, and participate in fire prevention activities and awareness raising, as well as other social activities in support of local youth, sport, and heritage preservation. A head of a recently established cooperating volunteer brigade in a large city in Hungary (WP9-06) described how his responding team aims to fill gaps with special skills and equipment to supplement and extend the local capabilities. On major incident sites, the NDGDM's Disaster Management Operational Service provides supervision for all volunteer assets (Tóth and Tímár, 2016b).

According to one informant (WP9-04), 10% of all alerts in the country are now attended by volunteer brigades, either individually or as cooperating assets; this means 8,000 responses by volunteer brigades each year. (His statement is confirmed by statistical data received from NDGDM, as shown later in this article.) Since 2010, the total number of volunteer brigades increased from 283 to 657 as the result of the additional support and competencies given to voluntary actors. The majority are classified as "cooperating" fire brigades without individual response competencies. Historically, Hungary had long developed its volunteer fire brigade movement, but after the Second World War, firefighting became a task for the national authorities. Communities across the country kept the memories and traditions, which was the base of the renewal of the movement. In contemporary Hungary, expanding the volunteer fire brigade movement is seen as an essential part of the development of national fire safety (WP9-04).

Table 3. Number of incident responses with VFB involvement. Source: NDGDM – Freedom of Information request

Year	2014	2015	2016	2017	2018	2019
Number of incident response involving VFB assets	3,903	3,923	4,746	7,711	5,582	7,496
Number of individual responses without professional presence	631	1,141	1,518	2,575	1,835	2,815
Number of cooperating responses	3,272	2,782	3,228	5,136	3,747	4,681

5.2. Responses, motivation and financial support

In the new system, "responding volunteer brigades" are alerted individually to incidents in which there is no immediate life-threatening danger. "If there is no indication in the 112 calls to immediate life-threatening conditions, and a responding brigade is on duty in the area, we alert them to attend the site. From this point, we rely on them to mobilise, attend, assess and eliminate the situation. If they are on-site and report back with their assessment indicating a life-threatening danger, we alert additional units" (WP9-04). Responding volunteer brigades can deal with minor incidents like smaller wildfires on the outskirts of settlements or small accidents with no or minor injuries, but they can also provide rapid reconnaissance over larger incidents and start the necessary life-saving tasks before the professional units arrive.

"Volunteering means giving up our time and knowledge to the community for free, but it does not mean that the volunteer needs to put money into his or her service" (WP9-04). Based on this principle, Disaster Management provides in-kind and financial support for volunteer fire brigades described below. According to WP9-01, the central budget support of volunteer brigades rose in the past years, but the contributions of local communities and local donors are still vital.

Central financial support for volunteer fire brigades began in 2010 in the form of regular "call for proposals". Every volunteer fire brigade association can submit their needs for equipment and specialised training in the annual call. The funding is covered by the central national budget, which in 2010, allocated 150 million HUF (approx. 511,700 EUR on 2010 exchange rates) for the volunteer fire brigades. As the number and competencies of the fire brigades extended, the allocation from the central budget rose. Last year (2020) 700 million HUF (approx. 1,85 million EUR) was dedicated to the central budget. This means that the average support rose from 530,000 HUF in 2010 to 1.044 M HUF (~2,750 EUR) in 2020. According to an interviewee, the equipment provided through these calls is high-quality, often state-of-art, and sometimes professional firefighters envy them because of their novel items. On the other hand, volunteer brigades can only choose from a pre-set equipment list, which limits their development and sometimes leads to mismatches with their real needs (WP9-06).

Responding volunteer brigades receive monthly financial allocations (~262,5 EUR / 447 EUR), based on their on-call obligations. In category one, the brigade is obliged to serve 4500 hours of on-duty readiness shifts through the year, while category two brigades are on-duty for 3000 hours annually. During their on-duty shifts, they must respond immediately (in a short mobilisation time) after they receive an alert through the radio. They also receive notifications of incidents when they are not on duty and can mobilise to incidents during this period as well. The eligible costs for this support include utilities, fuel, maintenance of equipment, purchase of equipment and other direct costs, with the exception of personal expenses. According to WP9-03, this monthly allowance is still low and only covers the minimum costs.

According to the data received from the national authorities, there were 10,515 individual incident responses managed solely by responding volunteer fire brigades since the introduction of this new method of collaboration. Mobilising volunteer units to these alerts, the new collaboration shortened response times and cut the costs of the possible alert of professional units. Using the average response cost of a professional fire engine (92 970 HUF according to (Bérczi, 2013) and the number of individual responses (10,515 cases, see table 3), 977,579,550 HUF (around 2,57 million EUR) would born as cost without the new responding volunteer structure. As presented earlier in Table 3, the on-duty hours of responding volunteer brigades have been constantly rising since 2014. During these hours, each RVFB has at least 4 trained volunteer firefighters ready to respond. Volunteer units offered readiness for 992,875 hours since 2014. Multiplied with a minimum 4 members in a unit, this equates of 3,971,500 person-hours. In comparison, professional firefighters work in 24 hours shifts with 2 days of break; with an average of 10 shifts/month. The average gross salary for a professional firefighter is 270,000 HUF (710 EUR). Following this calculation, responding volunteer firefighters substituted salaries of 16,548 per month, equating to 4,467,937,500 HUF (around 11,8 million EUR). However, this calculation is indicative and approximate only, it shows the financial importance of the volunteer contribution of RVFBs to cut public spending.

Besides the clear budgetary benefits of the introduction of responding volunteer brigades, their work indeed contributes to the safety and resilience of communities across the country, the collaboration with volunteer units certainly provides faster deployment of fire assets, however, no detailed data is available on this issue.

All informants expressed the need for a stronger appreciation approach to recognise the contribution of volunteer firefighters and attract more potential volunteers. According to the informants, recruitment is one of the most challenging aspects of the volunteer brigades. While rural areas face depopulation and ageing, social cohesion and bonds in larger cities are less tight. Although their headcount has increased significantly over the last decade, the longer sustainability of the trend is questionable. While WP9-02, 03 and 04 emphasised the need of individual benefits like tax reduction, WP9-05 expressed that the most important factor in motivation is to feel recognised and supported collectively as a volunteer brigade. This could be strengthened through central provision of vehicles and equipment, and other better enabling actions involving host communities and more accommodating attitudes from employers.

5.3. Administrative Procedures and Red Tape

The introduction of the category "responding volunteer brigades" certainly brought some development in bureaucratic requirements with the opening up of hitherto closed governmental systems and formalising collaborations. NDGDM Written Command 2/2014 and 2/2019 detail different procedures and obligatory administrative actions, for example, "responding volunteer brigades" must

organise internal training every quarter of a year, with mandatory attendance for the volunteers involved. According to informants WP9-04 and WP9-05, these obligations could be administrative and bureaucratic burdens with many details to bear in mind, but the Professional Fire Commands provide guidance and support for each volunteer brigade to mitigate these. In the scope of this support, a mentoring scheme has been introduced, involving a professional firefighter who knows the operational area of the mentored brigade and supports them in their different professional, administrative and training tasks.

The most crucial difference between the administrative burden of a regular "cooperating volunteer brigade" and a "responding volunteer brigade" is related to the procedures of alerting and after-action reports. Regular "cooperating" brigades receive notifications through SMS, and they can decide upon the available personnel and resources if they mobilise to the incident. "Responding" brigades got alerts through radio (EDR/TETRA) if they were on-duty with a minimum of 4 volunteers, and they were obliged to respond.

While regular "cooperating" brigades maintain their logs of their actions and report them verbally through radio to the professional units and the dispatch centre, the "responding" brigades have an account to NDGDM's "Disaster Management Data Provision Programme" (KAP), a real-time data management software used by the central operation control. The RVFB must register their on-duty readiness at the beginning of their shift in KAP and document any changes in their readiness. "Responding" brigades must upload after-action reports for each of their alerts attended. According to WP9-05, the leader of an RVFB, using KAP for after-action reports is a natural part of their work and is not a burden. The reporting system provides an easy-to-use survey-like surface to input all necessary details of deployment, making reports more accurate and prompter than the old paper-based reporting systems. The submitted reports appear instantly on the devices of the operations room and can be accessed by relevant officials. The system also generates statistics for planning and development purposes.

5.4. Information and Communication Systems supporting collaboration

Responding volunteer fire brigades use three obligatory information and communication systems, with additional voluntary solutions. Mandatory systems aim to integrate voluntary units into the overall coordination structure of the Hungarian fire and rescue services. They include (1) a central coordination system to alert and inform units about incidents, (2) a closed and encrypted radio communication, (3) and a standardised system for after-action reports.

1. "PAJZS" is the central operation coordination system used by the NDGDM. It receives all calls in need of firefighting capacities. Calls can be received through the central emergency line (112 or 105), or through other emergency agencies (police, ambulance services), but it has a direct connection with automatised fire alarm systems as well. Whenever a call is received, the system sends out automatised SMS notifications and an email detailing the alert to the Volunteer Fire Brigade leaders in the corresponding area (both for responding and cooperating fire brigades).
2. "EDR" is the nation-wide governmental TETRA radio system. It uses a specialised mobile network to provide secure and encrypted radio communication for law enforcement and other agencies. "EDR" provides a quick and secure way to communicate between the operations room and the units alerted and on-site, but network coverage is low in scattered areas across the country, as reported by WP9-05.
3. "Katasztrófavédelmi Adatszolgáltatási Program – KAP" – the 'Disaster Management Data Provision Program', detailed earlier.

In addition to these systems, there are various self-developed ICT tools used by volunteer brigades. Many brigades use for example smartphone apps and data translation services to convert incoming alerts to their volunteers in a more informative way. These systems can be used to alert the volunteers with pre-installed alert apps on their phones.

Many volunteer fire brigades use different free or open-source applications, some of them even have their own IT system developed by local professional in-kind supporters. As these solutions varied across the country, the need for the development of a central alert application was mentioned across the interviews. Mobile applications could assist volunteer brigades in shift-planning, in training and in day-to-day operations as well.

6. Discussion

Previous research shows that national governments have a critical role in building the trust needed for good inter-organisational collaboration to develop local resilience (Jung and Song, 2015). Volunteer brigades provide a chance to contribute to the safety of the community and beyond, therefore we argue that the development of a strong volunteer firefighting movement favours community resilience across the country. This development started in Hungary with the extension of competencies and the growing importance of volunteer brigades in the past decade, but the process is still ongoing, and possible future milestones are yet to be identified.

As seen before and under in Table III, responding volunteer brigades have wider competencies and obligations, but have access to continuous and structured professional and financial support from the professional fire brigades. This shows that the involvement of responding volunteer fire brigades shifted from cooperation towards the collaboration end of the cooperation-collaboration continuum defined by Kamensky et al. (2004). This leads to a higher level of local preparedness in settlements where responding volunteer fire brigades are located.

As the informants expressed, the current upward trend in the number of volunteer brigades and their headcount is not sustainable. Demographic and societal challenges are expected to influence the recruitment and retention of volunteers. Informants shared some ideas to enhance recruitment and recognition of volunteers for better motivation. Ideas included individual and collective incentives that can be further explored in future research. Individual incentives could entail tax reductions, service discounts, wider access to healthcare, and financial compensation for employers contracting volunteer firefighter employees. As there are current discussions to renew legislation around the benefits for volunteer firefighters in Poland, we argue that a regional discussion on current policy challenges would be beneficial. The Polish proposal includes a widened insurance scheme, as well as pension supplements for volunteer firefighters based on the length of their service.

Collective incentives focus on stronger financial and in-kind support for volunteer brigades. According to the informants, volunteer brigades usually procure their vehicles and the vast majority of their equipment through twin-city relations. There is no available data on the average age of fire engines used by volunteer brigades, but we observed that many of their vehicles are over 40 years. Although fire safety and rescue are national competencies and local governments don't have dedicated funding for developing and maintaining volunteer brigades, volunteer firefighters still are reliant on the support of local communities, donations from local businesses as well as the financial support of municipalities. Volunteer brigades are important elements of the local communities; therefore, many municipalities allocate resources to give financial and other support, but the centralisation tendencies in the recent decade have significantly narrowed local governments' budgetary room. As described earlier, the monthly allowance of RVFBs is not sufficient to cover unforeseen costs, not to mention the development and purchase of new equipment.

Table 4. Comparison of responding and cooperating fire brigades

	Responding volunteer brigade	**Cooperating volunteer brigade**
Capacities	fire engine with standardized equipment ready for alert min. 4 trained firefighters (1 engine driver and 1 on-site commander) during on-call hours	capacities varied on a large spectrum (no minimum requirements)
Duties	3000 hours or 4500 hours on-call obligation, with instant response to nearby incidents	Optional cooperation in fire prevention and firefighting activities.
Alerting/notification	Alerting through TETRA radio and SMS/e-mail	Notification through SMS/e-mail
Reporting	Reporting using TETRA radio and standardized report forms	Reporting using TETRA radio, standardized reporting forms filled by professional units
Professional support	Structured mentoring Professional oversight Participation in training	Professional oversight Participation in training

Financial support	Monthly cost allowance (262,5 EUR or 447 EUR depending on on-call time) Financial coverage of equipment through a call for proposals Own fundraising activities	Financial coverage of equipment through a call for proposals Own fundraising activities
ICT	Alerts from the central operation coordination system ("PAJZS") Access to TETRA and online reporting system ("KAP") Self-developed systems varied across volunteer associations	Notifications from the central operation coordination system ("PAJZS") Access to TETRA Self-developed systems varied across volunteer associations

Information Communication Technology is an important part of effective collaboration with responding volunteer brigades. Opening the internal governmental systems to private citizens (volunteers) is a major step towards a closer public-private partnership in fire safety and local community resilience. According to the interviews, further development is needed to transfer data crucial in deployments to the volunteers. Smartphone applications can further assist shift management, alerting and training activities as well while providing instant access to information needed for a swift and accurate on-site response. The development of such a system should be based on the needs identified by the volunteer firefighters themselves, built on their experiences and needs, and kept open for further additions.

7. Conclusions

This current case study shows the importance of the involvement of local volunteer actors as first responders in the national fire and rescue services. Even in the case of a nation-wide centralised professional fire brigade under the umbrella of a central governmental organisation, private citizens can contribute to the safety of their communities as volunteers if the government enables and embraces them. To support these initiatives, systematic inclusion of volunteer assets into the overall response system is essential, which should expand the narrow field of public safety to wider policy areas. Providing an enabling societal environment, a longer-term approach is needed to address the phenomena of rural ageing and depopulation, as well as urban alienation as main constraints in the recruitment of volunteer firefighters. The Hungarian example shows that local volunteer fire brigade associations rely on the support of their communities and the local governments, but this can clash with the centralisation tendencies of the country, causing narrowed competencies and budgetary options of municipalities. This policy contradiction should be addressed in the future to establish a better enabling environment for the engagement of volunteer fire brigades. Further analysis is needed to determine policies founding the sustainability of volunteer brigades, including appreciation and recognition to embrace them and support their recruitment activities.

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