FIREFIGHTING AND RESCUE SOLUTIONS FOR RURAL AREAS OF THE REPUBLIC OF LATVIA

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Abstract. The issue of the firefighting organization in rural areas is particularly important and topical today. More populated places in Latvia currently have no firefighting structural units therein located because the number of existing firefighting stations is insufficient. According to statistical data, no country in the world can afford to organize the presence of a professional fire and rescue service in every populated place. A solution to the problem can be the development of volunteer firefighter associations and volunteer firefighter brigades. The study is aimed to evaluate the creation of voluntary fire safety, firefighting and rescue service models at the municipal level in the Republic of Latvia, to find and propose efficient solutions for the creation of voluntary fire safety, firefighting and rescue service models.

Key words: firefighting, rural region, volunteers, municipality.

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Introduction

In recent years, a steady downward trend remains in the number of fires and the number of people who have lost their lives and/or suffered in fires. Of course, this is due to the increased proficiency and improved work organization of fire departments in Latvia. An important role is played by improvement of normative base in the field of fire safety. However, serious problems exist. Particularly important and topical issue is the firefighting organization in rural areas. At present time, there are more populated places in Latvia where no fire department is located since the number of fire stations is insufficient. According to statistical data, no country in the world can afford to organize a professional fire and rescue service in every populated place. As a solution to the problem can be the development of volunteer fire associations and volunteer fire brigades. All over the world there are volunteer fire formations and each country has its own nuances. For example, in Ireland only the capital city of Dublin has a professional firefighting organization while all other populated places have mixed fire brigades consisting of both professional fire teams and voluntary fire teams. In Belgium, almost all firefighters are volunteers. Firefighters are granted serious privileges, therefore when completing the fire-fighting units the preference is given to technical professionals, athletes, people who taking into account the specificity of work have a lot of free time. It is notably that 7 % of the volunteer firefighters in Belgium are women. Volunteer fire associations are widely developed across Europe: UK, Austria, Denmark, Italy, Finland, France, Germany, as well as in the United States. The feature of European volunteer fire associations is that they are incorporated in social formations - unions, associations - along with professional firefighters and scientific and technical organizations engaged in the development of firefighting equipment and firefighting outfit.

In Latvia, procedure under which the State Fire and Rescue Service carries out and manages firefighting and rescue works is determined by the Cabinet of Ministers.

Nowadays, not only regulatory enactments can bring specific and practical approaches for tackling the problems in a particular field. A regulatory enactment is usually a summary of regulations, which shows the direction but the problem-solving way usually is not straight.

The study is aimed to evaluate the creation of voluntary fire safety, firefighting and rescue service models at the municipal level in the Republic of Latvia, to find and propose efficient solutions for the creation of voluntary fire safety, firefighting and rescue service models.

1. Fire safety and firefighting in Latvia

The Fire Safety and Firefighting Law specifies the system of fire safety, firefighting and rescue
services and organizations, the tasks and competence of natural and legal persons and expertise in the field of fire safety and firefighting, as well as the functions of the State Fire and Rescue Service (hereinafter referred to as SFRS) functions and the duties, rights and legal protection of SFRS officials with special service ranks (The Cabinet of Ministers, Fire Safety and Fire-fighting Law).

To evaluate the fire and firefighting systems, it is necessary to know what fire safety, firefighting and rescue services and organizations exist in Latvia, what their duties, tasks and rights are.

According to the Fire Safety and Firefighting Law, Article 4, paragraph (1), Latvia has the following fire safety, firefighting and rescue services and organizations:
1) State Fire and Rescue Service;
2) fire safety, firefighting and rescue services of institutions, organizations and commercial companies;
3) local governments’ fire safety, firefighting and rescue services; and
4) voluntary firefighter organizations.

2. Core of the problem

Today’s world is rapidly developing in more fields, such as production, culture and entertainment in big cities, extensive construction works in residential sector, lightning-fast changes in infrastructure, big part of people from rural areas goes to cities for a better education and a job. A big number of people and vehicles leads to traffic jams on streets and roads, which makes difficult getting to the scene on time. In yards of multi-storey residential buildings courtyards the operative transport vehicles face movement problems because with each passing day more and more cars are chaotically parked in the yards blocking the roads. Rural areas have other problems, such as distance from SFRS station to a possible incident scene and access roads.

The main problem is, first, to reach the incident scene as soon as possible in order to save human or animal life, provide first aid, reduce material damages, harm to environment and so on and second, to meet the requirements of Fire Safety Regulations. Fire safety risk analysis is one of the necessary approaches helping to ensure the necessary and sufficient level of safety (Hasofer, A., Beck, V. R., & Bennetts, I. D. (2006)). As mentioned by Degel, D., Wiesche, L., Rachuba, S., & Werners, B. (2014) volunteer fire departments have been founded to ensure public safety in case of fire and to provide support for professional firefighters. Most of the current stations date back to the beginning of the 19th century. Today, volunteer fire departments face numerous challenges, such as reduced number of following young volunteers or decreasing public budgets. In most countries, the network of fire stations has historically grown one station at a time as new needs and means for prevention and protection emerged. The fundamental question underlying this research problem is: given a time norm (e.g. 8 min) within which 90 % of fires must be reached, what is the lowest-cost solution that can achieve this? The main decision variables are the location and staffing of fire stations, and the proposed approach is intended to guide retrospective assessment as well as prospective planning.

SFRS ensures arrival of its units at the incident scene (The Cabinet of Ministers, No 279; The Cabinet of Ministers, No.398):
1) in towns of national status – within five minutes after call is received;
2) in other towns and rural territories with population density 10 and more people per square kilometre – within 15 minutes after call is received;
3) in rural territories with population density less than 10 people per square kilometre – within 15 minutes after call is received.
Fire and Rescue Service of the Republic of Latvia has 43 brigades and 49 stations, of which (State Fire and Rescue Service of Latvia):

- in Riga - 15 brigades and 6 stations;
- in Latgale - 9 brigades and 10 stations;
- in Kurzeme - 6 brigades and 10 stations;
- in Zemgale - 6 brigades and 11 stations;
- in Vidzeme - 7 brigades and 12 stations.

In total, 92 firefighting departments are established in the Republic of Latvia (State Fire and Rescue Service of Latvia).

Municipal firefighting formations as well as voluntary firefighter organizations are established in the Republic of Latvia. But most of them have a primary purpose not only to provide assistance and support for the State Fire and Rescue Service. Assessing the situation in the country and summarizing the data about registered formations, the following information was obtained.

1) Number of volunteer firefighter organizations in the country – 42. Activities and number:

- firefighting - 9 organizations;
- provision of fire safety services - 23 organizations;
- provision of other services - 10 organizations.

2) Number of municipal firefighting formations in the country - 35. In 2014, volunteer firefighter organizations and municipal firefighting formations participated in firefighting works - 322 times (State Fire and Rescue Service of Latvia).

Assessing the existing situation with the volunteer firefighter organizations and municipal firefighting formations in the Republic of Latvia, it was concluded that the municipal firefighting formations as far as possible provide assistance to the State Fire and Rescue Service in firefighting works and partial assistance is provided by volunteer firefighter organizations. However, as mentioned in C. Y. Li (2013), the inter-regional mobilization is the scene of the fire power of the commanders of major hazard of fire according to first make the decision that the activities of fire rescue and command necessary step, whether the power to mobilize quickly, accurately and reasonably, is directly related to fire fighting and rescue operations success or failure.

3. Necessity to create models of volunteer municipal fire safety, firefighting and rescue services in Rezekne and Vilanu Regions

Modern rural settlements differ a little from towns in terms of appearance, improvements and fire protection. However, the existing old settlements often do not comply with fire safety requirements. Wide use of combustible materials, densely built-up areas of residential houses and household outbuildings, unavailability of firefighting water intakes, small number of fire departments, disorganized road infrastructure as well as in some cases insufficient communication contribute to rapid spread of fire. Flying sparks give birth to new bodies of fire. Due to wind, sparks can fly at a long distance and as a result a fire spreads over a large area. Rural territories are divided into residential and production areas. The residential area includes residential compounds and public centres. The production area is composed of buildings and structures, which are combined with technological processes, energetic and sanitary facilities and transportation systems. Distances between residential and household outbuildings do not comply with existing standards; built-up area is dense, as well as combustible materials are used in the construction. Such populated places mostly have no firefighting water supply and rivers, lakes, ponds, wells and artesian wells are used as water intakes.

Water delivery for fire extinguishing is often hampered due to heavy access roads, lack of roads at water intakes or low water levels in wells as well as difficult use of well in winter. Roads in rural areas do not always have a solid coating, which hampers transport traffic.
Fires in rural areas can be divided into three groups: fire in residential area; fire in production area; and fire in a standalone facility. Dense built-up area of residential houses, existence of wooden household outbuildings and combustible roofing contribute to the spread of fire over residential houses and onto adjacent buildings.

Calculation of potential fire brigade arrival time from the nearest depot in a rural region:

$$ T_{\text{trip}} = L \times V $$  \hspace{1cm} (1)

where $L$ – distance to incident scene (Ivannikov & Klus, 2007);

$V$ – average speed of tank truck.

It can be concluded that the required arrival time is 32 minutes, but it does not mean that the first SFRS unit will be able to arrive at the incident scene after 32 minutes. Time significantly depends on the time the fire breaks out and is detected, notified, SFRS departure from the depot, the distance from SFRS depot distance to the incident scene and the time of SFRS deployment at the incident scene. In one word, it is the fire free development time.

The precious first ten minutes (initial phase of fire) will be lost by the time the firefighters arrive. These minutes are the most important, because the flame then spreads twice slower than during the basic phase of fire.

Accordingly, the calculation of the burnt areas is made for the 39th minute, because it is assumed that 6 minutes will be required for the deployment of equipment.

Determine the fire spread if $t_3 - 39$ min.

Calculation by formula:

$$ P_u^{39 \text{min}} = 5U_1 + U_1 \times t $$  \hspace{1cm} (2)

where $U_1$ – fire spread linear speed equal to 1.0 m/min (Ivannikov & Klus, 2007);

$$ t = t_3 - 10 \min = 39 - 10 = 29 \text{ (min)} $$

$$ P_u^{39 \text{min}} = 5 \times 1 + 1 \times 29 = 34 \text{ (m)} $$

Calculate fire area on $t_3 = 39$ min by formula:

$$ S_u^{39 \text{min}} = (34+4) \times 20 = 760 \text{ (m}^2\text{)} $$

It can be concluded that 760 m$^2$ area has burnt out, which is equivalent to a considerable household outbuilding and will cause essential economic damages as well as endanger other neighbouring facilities.

4. Possible maintenance costs of models of volunteer municipal fire safety, firefighting and rescue services

Each person has parish premises, garages, former household outbuildings or workshops, which can accommodate at least one fire tank truck and personnel. Maintenance of the State Fire and Rescue Service stations requires more than EUR 100,000. But if conditionally calculate the maintenance costs of municipal volunteer firefighter association, it can be concluded that their necessary maintenance costs are lower:

- Fuel - EUR 1,000/year (trips to incidents, maintenance and training);
- Tank truck maintenance - EUR 1,000/year (repairs and maintenance);
- Electric power costs (200 kWh/month) - EUR 400/year;
- Water and sewerage costs - EUR 100/year;
- Other public utility services, waste removal - EUR 100/year;
- Heating fuel - EUR 500/year;
- Equipment - 300 EUR/year;
- Compensation of municipal volunteer firefighter (truck driver) (best option – 2 people per civil parish, of which one permanently on duty) – EUR 600/month before taxes – 7,200/year (salary charged in accordance with hours worked);
- Compensation of municipal volunteer firefighter (best option – 3 people per civil parish, of which one permanently on duty) – EUR 500/month before taxes – 6,000/year (salary charged in accordance with hours worked).

The maximum costs would be not more than EUR 20,000. One of the best options is to place municipal volunteer firefighter units in the territory of parish administration buildings or next to it. Then the maintenance costs would be lower since remote standalone premises and

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garages require a separate funding, but if they are located directly in the territory of parish administration buildings, they are maintained for the account of funding allocated to the parish administration buildings. The same can be applied to the municipal volunteer firefighters and local volunteer firefighters - drivers. If their deployment place will be maximally close to the parish administration building, then during the day they can perform other duties (if there is no call for an incident) or perform basic functions in the parish administration for other salary. Accordingly, leaving for an incident they shall receive a contractually agreed remuneration for the work.

5 Models of volunteer municipal fire safety, firefighting and rescue services: training and social guarantees

The first main objective is to develop and approve an external regulatory enactment on municipal voluntary fire safety, fire and rescue services or associations. It desirably would be the law "On municipal voluntary fire safety, fire and rescue services or associations" that would regulate the activity status, tasks, functions as well as definitions of municipal voluntary fire safety, fire and rescue services or associations. According to it, the firefighters association would be established in such populated places to reach which a professional firefighting service would spend too much time and be unable to meet legislative requirements. It is also possible to establish municipal volunteer firefighter associations in other populated areas and facilities in order to provide assistance for the professional fire service. Logistical support of municipal volunteer firefighter association shall be carried out for account of their funds as well as from national and municipal support and other sources meeting national legislation.

Another serious and important issue is associated acquisitions, compensations and benefits for municipal volunteer firefighters, of which we can propose the following examples.

1) Establish social and legal guarantees for municipal volunteer firefighters and their families.
2) Exemption from work or studies without salary retention (for working inhabitants) but retaining their job, place of study, place or position for the time of firefighting or rescue work in the volunteer firefighter association or brigade, or for the time of professional training.
3) Compensation for absence at basic workplace or studies for the time when a firefighter carries out firefighting or acquires vocational training.
4) Compensations are provided in the employment contract for fire prevention or firefighting and rescue operations.
5) Compensations for performance of a municipal volunteer firefighter duties during time free from work or studies.
6) Coverage of costs associated with travel from the place of residence, workplace or place of studies to the place of vocational training and back.
7) Repayment of costs of work trip associated with professional training.
8) Assigning the right to join without a competition a firefighting technical educational establishment, on condition of successfully passed entrance examinations.
9) Firefighters of municipal volunteer firefighter association of territorial departments at their workplace shall be granted annual leave without pay for a period up to ten calendar days.
10) Besides, local governments shall offer discounts on payment of housing, property tax etc.

Conclusions, proposals, recommendations

Having summarized the available information, the authors concluded the following.
1) In 2014, volunteer firefighter organizations and municipal firefighting formations participated 322 times in firefighting works.;  
2) Most part of volunteer firefighter organizations is only engaged in profit gain, their main purpose is the provision of paid services in the field of fire safety.  
3) Taking into consideration the possibilities of national budget, SFRS cannot afford to establish firefighting depot in every populated place as well as with firefighting and rescue works in rural areas (uncovered rural areas).

To solve the problems, the authors put forward the following proposals:
1) to develop law on municipal fire safety, firefighting, civil protection and rescue service;  
2) to create in municipalities (uncovered rural areas) the models of municipal volunteer fire safety, firefighting and rescue services, also with involvement of volunteer firefighters;  
3) to provide municipal volunteer firefighters with social guarantees and popularize their work in society.

**Bibliography**


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