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Professional paper

HEADQUARTERS FOR EMERGENCY SITUATION AS ELEMENTS OF THE RISK MANAGEMENT SYSTEM FOR LARGE FOREST FIRES

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Abstract: *In recent years, forest fires are becoming more frequent, which is partly a consequence of global warming and the appearance of extremely hot summers, more frequent occurrences of drought, as well as increased wind intensity, but primarily as a consequence of great human carelessness and sometimes evil intentions. Large forest fires are a serious danger and their occurrence and spread directly endangers people, buildings, material goods and the environment. Emergency situation during this type of fires can be declared when a large area of quality forest is affected, when there is an immediate danger to people, material goods or the environment. When declaring an emergency situation, emergency headquarters and expert operational teams are activated whose task is to manage the risk in forest fire protection and to take measures to reduce the risk and protect people and material goods. The functioning of the operations centers and the effective implementation of measures have a direct impact on the efficiency of extinguishing large forest fires and the degree of efficiency in protecting people, buildings and property. The main goal of this paper was the analysis of the work and significance of the headquarters for emergency situation as a risk management factor in forest fire protection.*

Keywords: emergency headquarters, forest fire, GIS, risk, legal regulations

ŠTABOVI ZA VANREDNE SITUACIJE KAO ELEMENTI SISTEMA UPRAVLJANJA RIZIKOM KOD VELIKIH ŠUMSKIH POŽARA

Sažetak: *Šumski požari sve su češći, kao posledica globalnog zatopljenja i pojave ekstremno toplih leta i češćih pojava suše, narušene stabilnosti kišne sezone i pojačanog intenziteta vetrova, ali prvenstveno kao posledica velike ljudske nepažnje, a ponekad i zle namere. Veliki šumski požari predstavljaju ozbiljnu opasnost i njihovo pojavljivanje i širenje direktno ugrožavaju ljude, materijalna dobra i životnu sredinu. Vanredna situacija prilikom nastanka ove vrste požara može biti proglašena kada je zahvaćena velika površina kvalitetne šume, kada preči neposredna opasnost za ljude, objekte i materijalna dobra, ili je u većoj meri ugrožena životna sredina. Prilikom proglašenja vanredne situacije aktiviraju se štabovi za vanredne situacije i stručno operativni timovi čiji je zadatak da upravljaju rizikom u zaštiti šuma od požara i preduzimaju mere kako bi se umanjio rizik i zaštitili ljudi i materijalna*

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dobra. Način rada štaba za vanredne situacije i efikasno preduzimanje mera direktno utiče na efikasnost u gašenju velikih šumskih požara i stepen efikasnost zaštite ljudi, objekata i materijalnih dobara. Osnovni cilj ovog rada bila je analiza funkcionisanja i značaja štabova za vanredne situacije kao faktora upravljanja rizikom u zaštiti od požara u šumama.

Ključne reči: štab za vanredne situacije, šumski požar, GIS, rizik, zakonski propisi

1. INTRODUCTION

Wildfires are the most extreme form of devastation or complete destruction of forests. The damage they inflict and the consequences they cause, as well as the forest area they destroy every year, make wildfires a worldwide problem that requires the involvement of all social institutions and entities in their prevention and suppression. More than 50,000 forest fires occur worldwide every year, destroying approximately 400,000 hectares of forests. The increasing number of forest fires is in correlation with a number of factors, the most common of which are: the frequency and duration of drought periods, the increasing presence of people in forests, non-compliance with legislation, etc. The occurrence of forest fires depends on climate conditions, humidity, the amount of flammable plant material and human activity (Ratknić, T. et al. 2018, Ratknić, T. et al. 2021).

Large forest fires are a danger and their occurrence and spread pose a danger to people, buildings, material goods and the environment. When large forest fires occur, a large organization is needed to remedy them, and under certain conditions, an emergency situation can be declared, in order to establish an organization that will more easily confront the raging fire. In such cases, emergency headquarters are activated and all structures are involved in order to reduce the risk and effectively fight the fire. The success of extinguishing operations depends on the way of organization and the use of all resources in preventing the spread of fire and protecting people and material goods. The risk management system in all its phases can use emergency headquarters as an element of forest fire protection.

2. METHODOLOGY

In this research, the method of analysis, generalization as well as integral approach have been applied.

To study the set of measures and procedures for prevention, preparedness and response to emergency situation caused by forest fires, method of analysis was applied. Law on Emergency Situations (Official Gazette of the RS, no. 111/2009, 92/2011, 93/2012), Law on Reducing the Risk of Emergency Management (Official Gazette of the RS, no. 87/2018) and Regulation on the composition, method and organization of the work of emergency headquarters (Official Gazette of the RS, no. 27/2020), was analyzed.

Method of generalization was used for the recommendations and proposals of measures in emergency situation as elements of the risk management system for large forest fires in Serbia. The integral approach involved looking at current regulations, guidelines and recommendations for the role of emergency headquarters as a risk management factor in forest fire protection. Suggestions were made for improving legal solutions in the area of their better functioning.

3. RESULTS

3.1 Risk management system in forest fire protection

Risk management involves a set of measures and procedures for prevention, preparedness, response to an unwanted event (accident) as well as remediation of the consequences of an unwanted event in order to reduce the risk and create conditions under which the risk can be more acceptable.

The consequences of forest fires (Đorđević, G., 2012) can be:

- Very severe - Large area affected by fire (several hundred hectares), with human casualties and major material damage to buildings;
- Severe - Large area affected by fire, without human casualties and major material damage to buildings;
- Medium-severe - Medium area affected by fire (several tens of hectares) and damage to buildings with certain material damage;
- Minimal - Smaller area affected by the fire (less than ten tens of hectares);
- Insignificant - Small area affected by fire (of several m²).

Efficient risk management in forest fire protection consists of four operating modes that complement each other and influence each other. Figure 1 shows a general scheme of elements of risk management in forest fire protection.

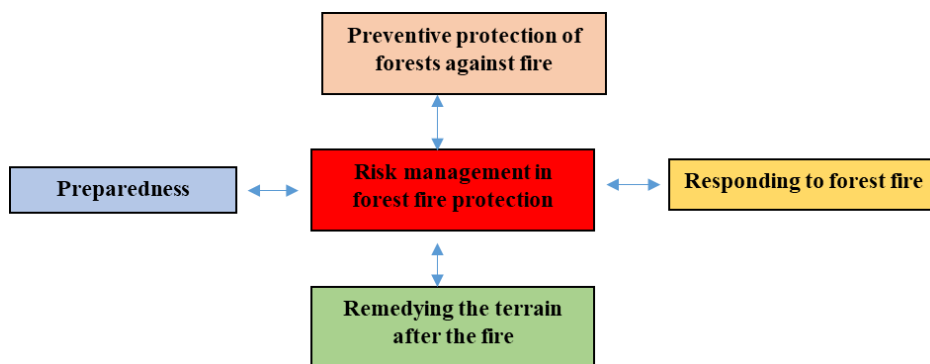


Figure 1. General scheme of risk management elements in forest fire protection

3.2 Emergency situation and responsibility of emergency headquarters

3.2.1 The concept of an emergency situation and the method of declaration

According to the "Law on Emergency Situations" (*Official Gazette of the RS*", no. 111/2009, 92/2011, 93/2012), a state of emergency is declared when the risks and threats or the resulting consequences of a catastrophe for the population, material and cultural goods or the environment are of such a scale and intensity that their occurrence or consequences cannot be prevented or eliminated by the regular action of the competent authorities and offices, which is why their mitigation and

elimination require the necessary use of special measures, additional forces and resources and enhanced work regime.

When it comes to forest fires, an emergency situation is most often declared when the event also occurs when it takes on a large scale and threatens the population, buildings and material goods. It is necessary to declare an emergency situation when there are extreme conditions for the occurrence of forest fires in order to take measures that will prevent the occurrence of forest fires.

In *Law on Emergency Situations (Official Gazette of the RS*”, no. 111/2009, 92/2011, 93/2012) an emergency situation is declared by:

- For the territory of the Republic of Serbia – the Government at the proposal of the state headquarters for emergency situations.
- For the territory of the autonomous province – the Executive body of the autonomous province at the proposal of the provincial headquarters for emergency situations.
- For the territory of the city or part of the city – the mayor at the proposal of the city headquarters for emergency situations.
- For the territory of the city municipality – the president of the municipality at the proposal of the headquarters for emergency situations of the city municipality.
- For the territory of the municipality – the president of the municipality at the proposal of the municipal headquarters for emergency situations.

3.2.1.1 Work of emergency headquarters during large forest fires

a) In order to prevent forest fires, the duties and tasks of the headquarters for emergency situations are:

- Holding meetings in times of immediate danger of forest fires and discussing the risks for their occurrence and the possibility of preventive measures.
- Contacting and exchanging information with meteorological services about weather conditions and monitoring weather alarms and analyzing the possibility of fire.
- Contacting and consulting with institutions and experts dealing with forest protection and preparing measures to be taken to prevent fire (for example, the interactive map in GIS is the basis of the forest fire risk management system - Figure 2).
- Giving recommendations, conclusions and orders regarding the danger and taking measures to reduce the risk (for example, place the cameras and visibility zones of area for the purpose of timely forest fire registration - Figure 3).
- Putting on standby all entities that deal with protection and have means, equipment, technique and expert staff for forest fire protection.
- Reviewing and analyzing forest fire protection plans and making sure that measures from the plans are followed.
- Forming a professional operational team for fire protection and experts who deal with forest fire protection and including them in the work of the headquarters.

- Activating the monitoring system of areas under the forest in the area where danger threatens and analyzing the ways of quick fire alarm if a fire occurs.
- Examining the condition of fire-fighting equipment as well as the water intakes of water supply for fire-fighting and issuing orders in case of deficiencies.
- Taking care of informing the public about dangers and providing notifications and warnings through public information media.
- Maintaining constant contact with professional services and is consulting on measures to be taken to reduce risk.

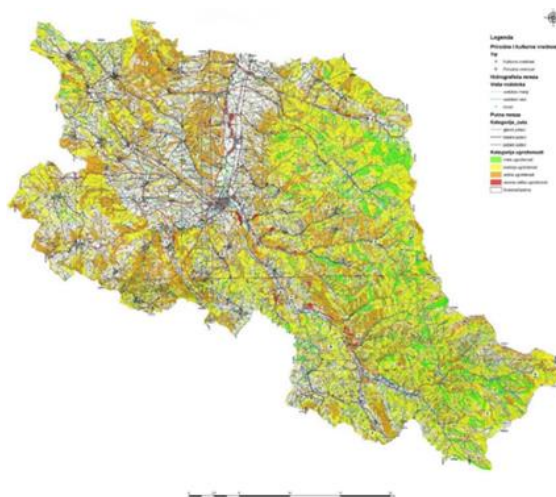


Figure 2. *The interactive map in GIS is the basis of the forest fire risk management system (Municipality of Knjaževac)*
(Source: Ratknić T. et al., 2021)

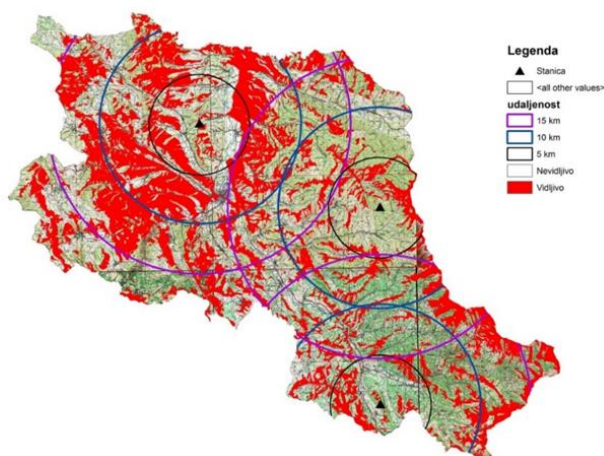


Figure 3. *Map of located cameras and visibility zones for the area of the Municipality of Knjaževac*
(Source: Ratknić T. et al., 2021)

- b) When a forest fire occurs, the duties of the headquarters for emergency situations are observing, and analyzing the situation and evaluating further events. It is necessary to get involved in the work of all structures at the local level that participate in the remediation of the consequences. The headquarters coordinate the work all public services that participate in the remediation of the consequences through the:
- Holding regular meetings and making recommendations and conclusions.
 - Coordinating providing and procuring equipment for remediating the consequences and means for extinguishing fires.
 - Monitoring the development of events, the spread of fires and coordinating the work of all entities.
 - Communicating and coordinating work with other headquarters for emergency situations if the fire has affected the area of several municipalities.
 - Seeking help from other authorities and offices if the situation requires it (use of the army, etc.).
 - Organizing the evacuation and medical assistance of the population according to elaborate plans.
 - Providing necessary provisions and food for people who are threatened by the fire.
 - Coordinating and ensuring that all infrastructure facilities and water supply for the population are in order.
 - Reporting and providing information through the means of public information.
 - Forming and coordinating volunteer teams and involving them in the work.
- c) The work of the headquarters for emergency situations after the event are:
- Forming the commission and assessing the damage.
 - In cooperation with expert services, consulting and providing assistance in terrain remediation.
 - Hiring machinery and other equipment for remediation.
 - Helping people whose buildings and property have been damaged by fire.
 - Making recommendations, conclusions and orders regarding the current situation.
 - If is necessary, ordering permanent on-duty staff and assistance in the area after the forest fire.

3.2.1.2 Organization of municipal headquarters for emergency situations

According to the Official Gazette of the RS, no. 27/2020, Headquarters for emergency situations are organized at several levels, namely: Republic Headquarters, Provincial Headquarters, District Headquarters, City Headquarters, and Headquarters for Emergency Situations of the City Municipality and Municipal Headquarters for Emergency Situations. Municipal Headquarters for emergency

situations as the most frequent participants in risk mitigation and risk management in forest fire protection.

The municipal headquarters for emergency situations consists of the Commander, Deputy Commander, Chief and members of the headquarters (representatives of municipal authorities, managers of public enterprises and companies, representatives of the Ministry of Internal Affairs, representatives of the Serbian Army, the Serbian Red Cross, citizens' associations, other legal entities and institutions and others in accordance with the proposal of the municipal administration and the organizational unit of the competent office for the territory of the municipality).

3.3 Phases in the work of emergency headquarters

The headquarters for emergency situations implements its activities through three phases: preventive phase, operational phase and recovery phase.

Activities in the preventive phase include the organization and implementation of tasks and measures implemented by the headquarters in the period before an emergency situation. The headquarters for emergency situations conducts activities to review the state of readiness for an organized response to risks and threats and familiarizes itself with the achieved level of development and building of the risk reduction and emergency management system.

The activities of the headquarters for emergency situations that are carried out in the operational phase are the direct management and coordination of subjects and forces of the risk mitigation system and the management of emergency situations in the affected territory in order to protect and save the lives and health of people, animals, material and cultural assets, the environment, infrastructure and other protected values.

After the end of the emergency situation, the analysis of the situation in the affected territory, in terms of the number and condition of the endangered and injured population, households, infrastructure, the analysis of the work of the participants and other necessary data as assessed by the emergency headquarters, are carried out.

The headquarters for emergency situations actively participates in the recognition of the need to undertake recovery measures, the organization and implementation of measures and tasks of restoration, reconstruction and remediation, taking into account the mitigation of the risk of future disasters.

3.4 Work of the headquarters during the risk of occurrence or occurrence of large forest fires

According to the Đorđević, G. (2012), in the case of extremely large fires, in addition to the head of the firefighting activity, there are:

- The Plan Manager, whose task is to provide maps and data after the reconnaissance, to monitor the meteorological situation and the development of fires, accept the replacement of personnel, provide supplies of water and food, inform the public.
- The Communication Manager ensures constant radio communication between the leaders of the firefighting activity, the municipal

- headquarters and the head of the firefighting sector and the people participating in the firefighting on the extinguishing line.
- The Equipment Manager takes care of the reception and arrangement of firefighting equipment, the supply and provision of firefighting equipment, the supply of fuel, etc.
 - Sector Managers manage the firefighting activity in their sector and coordinate the work of commanders in each sector.

Duties and tasks in the organization of extinguishing large fires are divided into four basic groups:

1. Planning activities (collection and analysis of information and creation of an action plan);
2. Activities on the fire line (safe, simultaneous execution of attacks and final extinguishing based on the extinguishing plan);
3. Insurance and support operations (insurance and deployment of personnel and equipment based on the established action plan);
4. Operations management tasks (coordination of all groups during firefighting, and implementation of all measures and tasks that ensure timely suppression of fire) (Đorđević, G. 2012).

In order to successfully extinguish all fires, regardless of their size, special attention is paid to firefighting plan, which is created on the basis of operational firefighting plans for specific areas, to which information is added about the specific fire that occurred. The preparation of the firefighting plan include fire reconnaissance, making a forecast of fire development and operational-tactical plan.

Depending on the size of the fire, the reconnaissance is carried out by the head of the extinguishing operation himself or by sector managers. The most complete information about large fires is often obtained from aerial reconnaissance.

Very important element in risk management in forest fire protection is the remediation of the terrain, that is, the actions and measures taken after extinguishing the forest fire. This element corresponds to the post-risk regime when the damaged system must be restored to its normal function. The duration of these activities depends on the degree of damage to the system and the possibility of remediation. In the forest after a fire, two comparative negative processes most often develop: the washing of the nutrient substrate from the soil surface and the appearance of harmful insects and diseases. One of the ways to prevent these negative processes is the removal of burned trees from the area where the fire occurred and reforestation (Đorđević, G. 2012; Ratknić, T. et al. 2017, 2018; Ratknić, T, et al., 2021).

The tasks of expert-operational teams during large fires are:

- Analyzing the situation in extreme conditions for the occurrence of forest fires and giving recommendations and proposals to the headquarters for emergency situations.
- In extreme conditions of forest fires, suggesting preventive and organizational measures to prevent fires from occurring.
- Establishing contact with other services and carrying out coordination and exchange of information essential for mitigating the situation.

- Suggesting a way to mitigate risk based on the situation in the field and providing guidelines for action on fire and how to protect endangered buildings and infrastructure.
- Exchanging information with the meteorological service on data relevant to the speed and direction of fire spread.
- Proposing the type of equipment for effective firefighting and cooperating with the office in charge of firefighting.
- Considering forest fire protection plans and proposing measures for remediation after the fire (Đorđević, G., 2022).

4. CONCLUSION

The role of the headquarters for emergency situations during large forest fires and the declaration of emergency situations is very important, and success in risk management in forest fire protection depends on the organization and manner of operation of the headquarters. In areas where forest fires are frequent, organization in all segments of risk management is of crucial importance. That's why the headquarters for emergency situations should be trained and equipped for situations when there is a danger of forest fires. This implies in the organizational part that the headquarters are staffed with people who are experts or are involved in forest fire protection, representatives of authorities and organizations that can help in the event of forest fires, as well as the procurement of adequate firefighting equipment. Headquarters should be used in all segments of risk management in forest fire protection, especially when there are extremely dangerous periods from the occurrence of forest fires.

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Uloga štabova za vanredne situacije prilikom velikih šumskih požara i proglašenja vanrednih situacija je vrlo važna, i od organizaciji i načina delovanja štabova zavisi i uspešnost u upravljanju rizikom u zaštiti šuma od požara. U područjima gde su šumski požari česti organizacija u svim segmentima upravljanja rizikom je od presudnog značaja. Zato štabove za vanredne situacije treba obučavati i opremiti i za situacije kada pretil opasnost od šumskih požara. To podrazumeva u organizacionom delu da u štabovima budu ljudi koji su stručnjaci ili se bave zaštitnom šuma od požara, predstavnici organa i organizacija koje mogu pomoći prilikom šumskih požara kao i nabavku adekvatne opreme za gašenje požara. Štabove treba koristiti u svim segmentima upravljanja rizikom u zaštiti šuma od požara, a naročito kada postoje ekstremno opasni periodi od nastanka šumskih požara.