

CERTAIN ASPECTS OF PROVIDING USE OF POLICE UNITS IN ACTIONS OF PROTECTION AND RESCUING IN CASE OF NATURAL DISASTERS¹

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Abstract: Police officers represent significant and very respectable force of the system for protection and rescue of people, material and cultural values from consequences caused by natural disasters. Effectiveness and efficiency of police forces depend on various factors, such as degree of abruptness, type, scale, intensity, phase and consequences of natural disaster, quality of training and equipping police officers, availability of response action plans and stable financial resources. However, experiences of the police in protection and rescue actions during the floods in May 2014, led to importance of exploring visibly present but not sufficiently explained theoretical aspects of the use of police units during natural disasters of catastrophic proportions.

Regarding this, the paper elaborates the issues concerning organization and functioning of telecommunications and geotopographic ensuring use of police units in actions of protection and rescue during catastrophic floods on examples from Obrenovac and Šabac. At the end of the paper, the concrete suggestions for improving the treated issues are given.

Keywords: functioning of police organization, natural disasters, protection and rescue, telecommunication security, geotopographic security.

INTRODUCTION

During natural disasters police faces unstable, dangerous situations that can endanger a large number of citizens. The occurrence of a natural disaster with catastrophic consequences can cause great human and material losses but it does not change the main social role of the police – both the government and citizens expect the police to continue to maintain public order. In addition to its primary role, the police must protect lives and property of citizens, conduct search for missing persons, conduct rescue operations, control and direct traffic in order to avoid congestion and blockage of roads designated for evacuation of citizens and delivery of humanitarian aid, warn citizens about possible dangers, conduct, if necessary, evacuation of the citizens from endangered areas, etc. Certain studies have shown that police generally are the first civil service that responds to natural disasters.² That first police response to a natural disaster includes the usual police activities, such as providing assistance to the citizens, transfer of information from the field to the communication centres and neutralization (minimizing) the physical consequences of an accident. In addition, the police have legal powers that other government bodies and services do not have, which may help in eliminating the consequences of natural disasters. Due to the daily contact with citizens, police have

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² Bonkiewicz, L., & Ruback, R. B. (2012). *The Role of the Police in Evacuations: Responding to the Social Impact of a Disaster*. *Police Quarterly*, p. 143.

information about the population in the area, the number of residents in a particular area, their place of residence, population structure (seniors - youth, capable of working - disabled, pregnant women and mothers with small children), etc. All these pieces of information are particularly important when searching for missing people and especially while conducting evacuation of citizens from endangered geospace.

The role of the police in these situations can have different aspects. For example, police officers can go door to door in order to inform and provide additional explanations related to directives to evacuate, they can assist in the implementation of planning routes for evacuation, they can facilitate the departure of citizens by transporting them in official vehicles, and carry out checks of settlements and residential buildings in order to determine whether the citizens fulfil the orders (instructions) for evacuation. When the evacuated citizens return, police may have different tasks, such as assisting inspection services in process of assessing damage done to the properties, distributing necessary nutritional support, providing information to the citizens about accompanying dangers of primary natural disaster (for example, if the water is contaminated after floods, if there are knocked poles for electricity supply, etc.).

The way of police work before, during and after a natural disaster can dramatically change although the social role of the police has not changed. For example, police officers may carry out security checks regarding citizens who have applied for the purchase of weapons, police officers can patrol the neighbourhoods, they can investigate reported crimes, protect public meetings, etc. However, if the occurrence of a natural disaster is certain and when it occurs, police officers can warn citizens about mandatory evacuation, they may participate in search and rescue operations or assist in the security inspection of residential buildings. Instead of solely focusing on maintaining public order and controlling crime, police forces are functionally oriented to providing assistance to endangered citizens.³ And throughout all the time, police officers must not neglect the duty to maintain public order.

In Germany, during the natural disaster, police have the following tasks: to warn people about the dangers; to protect life, health and property; to restrict the access to the endangered areas; to clear the roads for emergency vehicles and rescue services involved in the protection and rescue actions; to cooperate in the rescue of endangered citizens and bring them to safety; to conduct defined police measures in traffic; to protect property; to prevent theft, etc.⁴

Experiences from police engagement during natural disasters such as when Hurricane Katrina devastated America in 2005 have shown that: police officers were not adequately prepared for a natural disaster; most police departments did not have an outlined plan for a hurricane; police officers were not trained and prepared for a disaster and they did not know what to do when the storm hit, the communication links were broken, so the police officers were left to themselves, and some of them behaved heroically; they did not have any plans how to evacuate the complete area; initially a unified command structure was established, but later, it collapsed; police officers needed help due to the large number of received calls; many police officers were in areas impacted by a hurricane and were not available to their units; police communications were cut; many police officers lacked food, water, fuel, and accessories such as flashlights, gloves, radios, etc; after the hurricane, many police officers worked 12-18 hours per day, seven days a week.⁵



Figure 1 Members of the Joint Forces of Police Directorate during protection and rescue operations, May floods (Source: MoI Republic of Serbia 2014)

Catastrophic floods that stroke Republic of Serbia in May 2014, forced the employees of the Ministry of Interior (MoI) of the Republic of Serbia to change their everyday working routine, and to adapt to the new situation. The Sector for Emergency Situations of the Ministry of Interior, as the main subject for protection and rescue in Serbia immediately sent all its forces and capacities to the affected areas - fire-rescue units, six specialist flood rescue teams, two teams of civil protection units specialized for the protection and rescue on and under water, a team for unexploded ordnance, with the available equipment. In the headquarters

3 Deflem, M., & Sutphin, S. (2009). *Policing Katrina: Managing Law Enforcement in New Orleans*. Policing, 3(1), p. 43.

4 Mladan, D., Cvetković, V. (2011). *Police deployment in emergency situations caused by weapons of mass destruction*. International scientific conference Archibald Reiss days, The academy of criminal and police studies. Belgrade, p. 276.

5 Rojek I. J., Michael, S. (2007). *Law enforcement lessons learned from hurricane Katrina*, Review of policy research, volume 24, number 6, p. 604.

of the Sector and in the organizational units, teams for operational duty, operators for receiving calls for help, acceptance and distribution of humanitarian aid, liaison officers and others were working 24/7. Police Directorate has engaged its units for protection and rescue operations (Figure 1): Gendarmerie, SAJ, PTJ, Police Directorate, Traffic Police, the Criminal Police (especially NKTC), helicopter squad and other services. Also, the employees of Telecommunication and Cryptography Directorate were involved, as well as other staff from the Sector for Analytical, Telecommunications and Information Technology and Sector of Finance, Common Tasks (Logistics) and Human Resources.

On average, 7,300 police officers of the MoI of Serbia were engaged per day, while the number of police officers deployed by the Police Directorate for the first 10 days of flooding reached number of 41,172 (Table 1), while only in the municipality of Obrenovac, which was one of the hardest affected municipalities there were 10,231 (Table 2) police officers of the Police Directorate of the Republic of Serbia engaged. Also, under the command of the Police Directorate, 500 student-volunteers from Academy of Criminalistic and Police Sciences were engaged daily, divided into four operating groups (1 group had 12-hour engagement) and a part of the teaching and non-teaching staff of the Academy, then a number of participants of the Police Training Centre in Sremska Kamenica, so we can talk about the joint forces of the Police Directorate, that is MoI of the Republic of Serbia.

Table 1 Overview of engagement of police officers of the Police Directorate during the emergency situation in the Republic of Serbia

14 th May	15 th May	16 th May	17 th May	18 th May	19 th May	20 th May	21 st May	22 nd May	23 rd May
924	3,302	5,095	5,224	5,716	5,291	4,781	3,955	3,728	3,156
Total		41,172							

Table 2 Overview of engagement of police officers of the Police Directorate during the emergency situation in the municipality of Obrenovac

14 th May	15 th May	16 th May	17 th May	18 th May	19 th May	20 th May	21 st May	22 nd May	23 rd May
14	17	1,090	1,474	1,665	1,598	1,351	1,186	1,067	769
Total		10,231							

In addition to the regular police duties performed by the police in Serbia, the police units in Serbia, during floods got special tasks imposed by the new situation, such as:

- Security protection of life and property of citizens endangered by floods (rescue and evacuation from flooded buildings and areas);
- Providing first aid, food, water, medicines and personal hygiene citizens in flooded areas;
- Strengthening of the existing and constructing new protective infrastructure along the river flows (raising higher and ensuring primary and if necessary raising secondary embankment);
- Securing territory and facilities after performed evacuation, to prevent committing criminal offences;
- Informing citizens, government bodies and services of the situation on the field where the units were engaged;
- Activities related to acceptance, transport and housing of evacuated citizens in reception centres;
- Remediation of landslides, and
- Surveillance and documenting from the air.

In the internal reports of the Police Directorate, the problems that particularly aggravated the work of the police in the field were highlighted. As especially difficult problems they stated the following:

- Extremely bad weather conditions:
 - a large amount of rainfall
 - low temperatures
 - extremely strong wind (wind gusts over 60 km/h reduced visibility)
- Impassable traffic routes:
 - most roads towards the affected areas were disrupted
 - evacuation roads in the settlements had reduced throughput due to congestion of both the streets and handling areas due to torrential debris, shifted cars and waste
- The lack of adequate equipment for flood responding - rubber boots, raincoats, motor boats, life jackets, ATVs;
- The lack of dedicated and modern geotopographic materials;

- Inadequate communication between the actors of protection and rescue actions, incorrect and partially correct information in the media, social networks and call centres of the MoI (locations for evacuation, number of citizens, etc.).

As the authors of this paper were present in the endangered areas during the flood executing specific tasks, along with various police units, they spotted a group of problems, whose solving should be implemented as soon possible, as the natural disasters are unpredictable and real security threat. Specifically, it was noted that a number of police officers did not have adequate training that could relate exactly to the execution of specific tasks for protection and rescue operations during natural disasters. In particular, the problems that were identified among the police officers of the MoI during the catastrophic floods were related to the facts that:

- A certain number of police officers cannot swim;
- A notable number of the police officers did not participate in training regarding rescuing a drowning person and are not familiar with the measures and procedures for the protection and rescue of people, material and cultural values during natural disasters;
- A number of police officers cannot steer the boats (they did not even know how to row);
- The largest number of police officers had no knowledge about proper raising of embankments (stacking bags of sand making provisional embankment) or how to use dedicated technical resources for flood protection, or how to protect primary embankments from decantation and landslides (water-proof fabric, special beams and wooden beams), and to construct secondary embankments (boxing barriers, prefabricated panels, etc. (Figures 2 and 3), and
- A number of police officers did not have sufficient knowledge of providing first and immediate assistance to the injured persons, particularly to the drowned.



Figure 2 *Incorrect and correct construction of provisional embankment*



Figure 3 *Impermeable foil for ensuring primary embankment and box barriers used for constructing embankments*

All the above indicates that the police officers throughout their education must have special training intended to carry out tasks of protection and rescue from natural disasters. Education in this field must be continued after the entry into service.

In addition to the above lacking competencies, there were evident problems in some security aspects of using the police forces in protection and rescue operations. This problem is elaborated in the following sections of this paper.

ORGANIZATION OF THE FUNCTIONAL COMMUNICATION SYSTEM OF MINISTRY OF INTERIOR OF REPUBLIC OF SERBIA

Police tasks specificity demands exchange of various types of information so the Ministry of Interior of the Republic of Serbia uses several different telecommunication systems. Through these systems, the transfer is done in various ways. Encryption is applied in case of transmission of sensitive information. Telecommunication systems which make a functional system of communications of the MoI of the Republic of Serbia are:

- multiplexing systems and telecommunications infrastructure,
- radio systems (analogue and digital),
- telephone systems,
- systems for transfer of encrypted messages,
- video surveillance systems.

Most tasks executed by the employees of the MoI of the Republic of Serbia (uniformed and other authorized police officers, as well as employees in the Sector for the Emergency Situations) are the tasks that are performed in the field, outside business offices. To perform these tasks, constant and reliable radio communication that allows continuous communication between members of the police in a particular area is necessary and crucial. For this purpose, the Ministry of Interior of the Republic of Serbia developed two systems which are in operational use at the moment - older analogue system (in use since 1960s) and modern digital system (in use since 2005).

Due to the growing security challenges, the needs of the MoI of the Republic of Serbia have greatly exceeded the capacities of used analogue radio networks.

TETRA standard was introduced as a standard for digital professional mobile radio system and with its characteristics completely solved all the problems that the existing analogue system had. The special quality of this system is the adaptability and flexibility (as an independent system in relation to public systems) in emergency situations, as well as the possibility of connecting with other, analogue or digital systems.

The Ministry of Interior of the Republic of Serbia owns and uses TETRA system since 2005. Currently, there are two switching centres and approximately 120 base stations functioning. Total number of users is approximately 10,000. The calculated coverage of national territory by the TETRA system signal is shown in Figure 4.

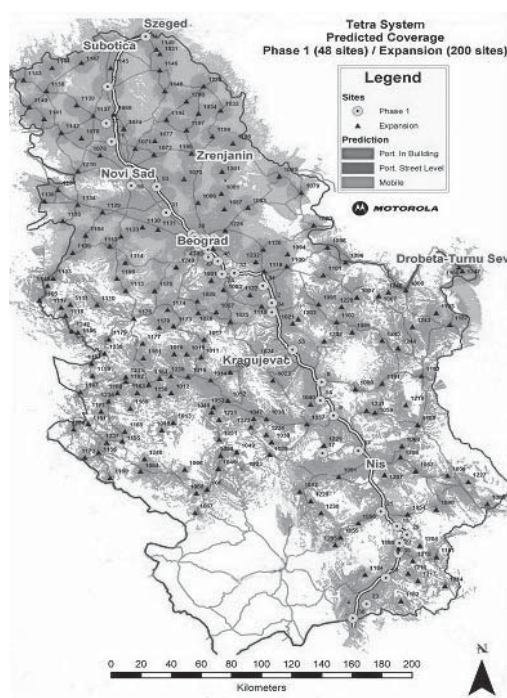


Figure 4 The coverage of national territory by the TETRA system signal (Source: Motorola, 2011.)

For the areas of national territory which are not covered by the TETRA system signal, as well as for the areas where the signal is weak, the Telecommunications Directorate prepared an interim solution for full operability of the system if such communication is needed. Also, using GPS receiver embedded in TETRA terminals, which enables positioning of the terminal, Telecommunications Directorate has developed its own system for automatic tracking of people and vehicles, based on software application Portable Tetra AVL.⁶

Systems for video surveillance are present in the Ministry of Interior for a long time, but their expansion began several years ago. One of the most important systems is video surveillance system of roads in Belgrade with 60 cameras. This system is intended primarily for monitoring traffic situation, but it is also used for other security purposes, for example to monitor various meetings in public places in Belgrade, for detection of crimes, etc.

Also, in Belgrade there is in use a system for automatic recognition of registration plates of motor vehicles and detection of traffic violations (ANPR system), which is the first system of that kind in Serbia.

In addition to these systems, the Telecommunications Directorate has prepared the conceptual design and the pilot project of video conferencing system that is intended to support middle and senior level police officers to make faster, more effective and more efficient decisions in acute, emergency and other complex security conditions.⁷

ASSURANCE OF TELECOMMUNICATION SERVICES FOR POLICE UNITS IN PROTECTION AND RESCUE ACTIONS IN CASE OF NATURAL DISASTERS

Experiences from the police interventions in conditions of natural disasters show that fast, secure and continuous communication is critical to the success in the protection and rescue actions. This is especially true in cases of natural disasters which are unpredictable, multiplied and have catastrophic consequences.⁸

One of many complex tasks of the Telecommunications Directorate was to assure telecommunication services during the floods that occurred in the Republic of Serbia in May 2014. With a well-designed system and trained personnel, the Telecommunications Directorate in a situation of complete break-down of public communication systems and termination of the distribution of electricity, succeeded to provide constant communication between all involved members of the MoI of the Republic of Serbia in all areas at risk of flooding. With that, Telecommunications Directorate enabled realization of the tasks carried out by the Ministry of Interior of the Republic of Serbia in the affected territories.

Here we can list some of the assignments the Directorate for the link and cryptography realized in this period:

- continuous work of all radio systems, with enhanced capacities of base stations of TETRA systems at the affected areas and with a complete transfer to alternative power source of electric energy;
- providing all necessary systems of links for undisturbed work of formed Republic headquarter for emergency situations, headquarters and units for protection and rescue in the MoI of the Republic of Serbia;
- providing video surveillance of the affected areas with constant supervision of security issues in headquarters for emergency situations;
- providing video surveillance from the air with a help of tactical aerostatic system, with the focus on night surveillance of the affected areas of Obrenovac;
- providing all necessary systems of links, as well as power source of electric energy for undisturbed work of created Headquarters for emergency situations in Obrenovac (Operational headquarter for defence against floods);
- diverting available part of equipment for communication from safe areas to affected areas (Figure 5);

⁶ Gligorijević, M., Đukanović, S., (2011). *GPS – Global positioning system and its applications in Policing*, International scientific conference Archibald Reiss days, The academy of criminal and police studies. Belgrade, vol. 1, pp. 429.

⁷ Đukanović S., Gligorijević M., Subošić D. (2012). *Video conference link as a way of communication of Heads in Ministry of Interior of Republic of Serbia*, *Security* 53, no. 2, p. 261.

⁸ For example, catastrophic consequences of Hurricane Catherine in Louisiana and Mississippi during 2005 caused among others, floods as secondary natural disaster that all together led to destruction of telecommunication infrastructure of police stations, interruption in chain of managing and commanding, dispersion of police forces and means, insecurity, inability to cope, stress, leaving Service, even occurrence of suicide at certain members of police.



Figure 5 Instalment of mobile base station TETRA in Obrenovac (Source: MoI Republic of Serbia)

- providing support to link units of police departments in the affected areas;
- providing radio communications among other members engaged outside the MoI of the Republic of Serbia during floods: the Serbian Armed forces, public companies (power distribution, post office, waterpower engineering), municipality authorities engaged in headquarters, emergency assistance, Institute for health care, utility services, mountain rescue services, veterinary services, etc.;
- assistance in providing alternative sources of electrical energy of Telekom and Telenor;
- work on enlightening the parts of Obrenovac with aggregates of the Directorate for the link and cryptography.
- Then, in order to monitor the situation in real time, at the initiative of the Directorate for the link and cryptography tactical aerostatic system was engaged – a balloon of Directorate of Border Police, with cameras for daily and thermal-vision surveillance (Jankovć and Milojević, 2014:42). The balloon was set at 300-400 m from headquarters in a city hotel (the height of the balloon lift is up to 200 m), and it covered the area of circuit diameter up to 5 km. During emergency situation, at the territory of Obrenovac a system of all 9 cameras has been used (8 air-video camera and one thermal-vision camera). Video signal of HD resolution from all cameras is distributed into headquarters: Obrenovac, the Sector for Emergency Situations, KOC 192 and the Cabinet of the Ministry (Figure 6).

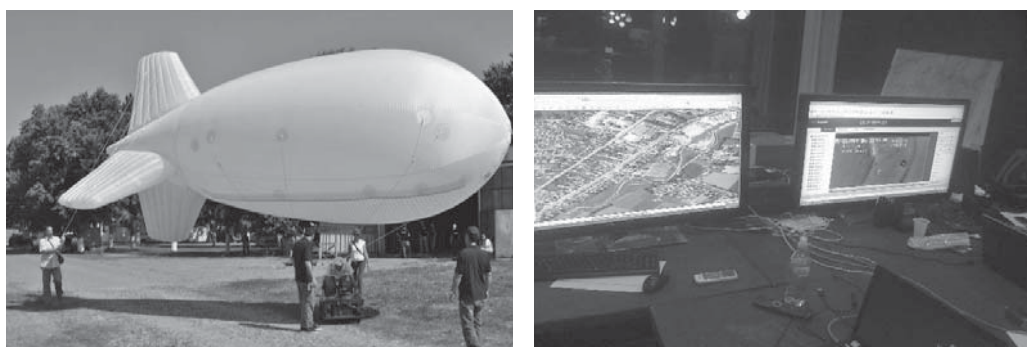


Figure 6 Tactical aerostatic system in Obrenovac (Source: MoI of Republic of Serbia)

To point out the significance and importance of uninterrupted system of communication in the chain of managing and commanding in emergency situations, we will present some basic parameters that made the pillar of communication system of the MoI of the Republic of Serbia during May 2014 floods. It covers the following:

- *radio connections* (repeater or mobile base station of TETRA system) – that provide necessary communication among operational units of the MoI of the Republic of Serbia in the field;
- *radio links* (networked repeater or TETRA system) – that provide communication and coordination of more Services included in rescue actions;
- *telephone connections and connecting roads* – that provide communication and managing from higher instances and coordination with citizenship;
- *video surveillance* – that provide real picture of current state in the field obtaining a higher degree of efficiency and timeliness in making decisions;

- All these components were necessary to provide and put into function in order to create conditions for continuous functioning of system links in the areas affected by floods. Of course, that is not easy at all having in mind catastrophic picture and problems that the members of the Directorate for the link and cryptography came across in the field. There, it includes the following problems:
- *Absence of adequate power supply of electric energy* – termination of functioning of electric network and absence of aggregate;
- *Termination of functioning systems of public telecommunication operators* – (*fixed connections* – the affected parts of system links of the MoI of the Republic of Serbia that rely on public operators and *mobile telephones* – completely interrupted communication with citizenship);
- *Sudden increase of number of users of TETRA system at small space* (problem of adequate organization of system links in those conditions), and
- *Large number of fake calls to telephone numbers for reporting problems.*

The members of the Directorate for the link and cryptography managed to solve all stated problems with their expertise, operability and long-time experience obtained through performing their work and tasks in the field of enabling to provide communication of all teams and headquarters of system for defence against floods. It is also very important to mention the fact that it is all performed by using the existing telecommunication capacities, resources and equipment designated for regular use.

Detailed analysis of all activities and performing of different units during emergency situation and the Directorate for the link and cryptography presented concrete suggestions for raising level of operability and functionality significant for future natural disasters, and they include the following:

- Provide alternative sources of power - resources (aggregates, additional equipment for aggregates and fuel);
- Issue procedures that regulate different levels of managing in emergency situations, as well as telecommunication systems that would be used;
- Issue order to mobile operators that in certain time period, by using mobile base stations provide uninterrupted mobile phone signal;
- Legally organize area “national roaming”;
- Improve radio-relay art of transport plane of the MoI of the Republic of Serbia (shown to be extremely important as redundancy);
- Define status and measures for malicious calls to the numbers of emergency services;
- Determine certain numbers of telecommunication capacities, resources and equipment (mobile base stations, radio stations, means for power supply, etc.) that will be intended for use only in actions for protection and rescue against natural disasters (floods, earthquakes, fire, drought, snow blizzard, extreme temperatures, etc).

CONCEPT, STRUCTURE AND STATE OF GEOTOPOGRAPHIC ENSURING OF POLICE UNITS USE IN PROTECTION AND RESCUE ACTIONS IN CASE OF NATURAL DISASTERS

Geo-security is a general term for overall activity of geosciences. The concepts of geotopographic security of the military, geotopographic security of the police, and geotopographic security of civil structures (architecture, civil engineering, urbanism, settlement planning, the cadastre of real property, environmental protection, etc.) have been derived from it. Geotopographic materials make up the foundation of geotopographic security. They are made in graphic, photographic, digital, numerical, and textual forms. Currently, the existing geotopographic materials for police purposes in Serbia are made by the Military Geographical Institute, the Republic Geodetic Authority, and other governmental institutions, as well as renowned privately-owned companies in the field of geomatics and geo-information technologies and privately-owned companies in the field of cartographic publishing.

The concept of geotopographic security as part of geosecurity involves complex scientific and research activities, production, education and distribution activities performed by civilian and military geodesic offices, institutions of higher education and research institutions, aimed at timely collection, processing, topic-focused modelling, delivery, exchange, updating, and storage of the data on the geographic space.⁹ Also, the aspect of providing specific and modern data about geospace is necessary in planning and

⁹ Milojković, B., Milojević, S., Janković, B. (2013). Some aspects of geo-topographic security related to the use of special police forces. Thematic Conference Proceedings of International Significance, International Scientific Conference „Archibald Reiss Days“, Belgrade: Academy of criminal and police studies, str. 147.

performing special security police tasks, especially in complicated security, timely and geospace conditions is relevant.

Experiences from interventions of special police forces in the national geospace in the past 20 years have shown that geotopographic security, as a kind of security, was relatively present, but that it was not theoretically defined. Thus, for instance, securing an intervention of special police units aimed at restoring large-scale disturbances of public order includes measures, procedures, and activities which prevent sudden disorderly activities of rioters or alleviate and eliminate effects of the large-scale public order violations and create favourable conditions for organized, timely and successful preparation and engagement of the police, i.e. it creates favourable conditions for the intervention of the police. In general, the types of security interventions of the police include: IT and telecommunication security, psychological – propaganda security, intelligence and security services, logistics security, medical security, geotopographic security, transportation security, fire fighting security, veterinary security, masking, safety at work and environmental protection.¹⁰

In addition, certain issues related to the geotopographic security of use of police units in protection and rescue of people, material and cultural values from the consequences of natural disasters are left open.

For example, for the purposes of planning and conducting evacuation of endangered people and goods, police needs geotopographic materials with the address system and communal amenities of residential, public and commercial buildings as well as knowledge of the affected geospace. In such circumstances, a notable number of police officers are not familiar with street structure of the settlement, because they come from different organizational units and there are not enough guides, so the orientation is slower and insufficiently accurate.

Then, for the purpose of planning the development of localizing embankment, police in addition to the knowledge and skills to build them, personal and common equipment, need the data regarding borrowing site of materials, i.e. pits where it is possible to load the sacks with sand or manipulative areas if the sand is transported from the quarry, as well as the information on the number of sacks that can be filled, loaded and transported from the average stock and the amount of sand that can be extracted or delivered in one-hour period by construction machinery or men. Also, they need the data about area(s) where units should be gathered (areas where natural disasters are expected), positions and capacities of sanitary, telecommunication, hydro-technical, quartermaster and other security, castling roads, accessible roads that lead to places where localized embankment are being made, performances and state of embankment (dimensions, proportion of steepness of banks, height, communicability, arrangement, coverage of vegetation, places of previous damages, etc.), places for rest and protection of people due to extreme temperatures, occurrence of insects, etc.¹¹

The most commonly used geotopographic materials for police purposes are: geodetic plans, topographic and thematic maps, photographic and digital geotopographic materials. But beside contemporary approach in producing the mentioned geotopographic materials, it is evident that they do not have sufficiently dedicated complete and updated cartographic content for police use, that is, they do not contain sufficiently specific and contemporary data on geospace for police purposes.

Currently stated data do not exist at one place, gathered, digitalized and processed with adequate databases and organized in necessary number of layers out of which according to the type of intervention they can be combined for process of graphical enclosures in plans of intervention and during monitoring of their flow, reporting, analysing and for other needs of managing and commanding. Specific data about geospace are not available to the police in necessary volume either for needs of planning or performing actions of protection and rescue in case of natural disasters.

Also, the fact that so far used content of geotopographic materials, especially topographic maps are not systematically updated for 15 or even over 35 years represents a problem. The update period is very long having in mind needs of the police, and as such, it does not fit into the results of larger studies of the optimal time interval for systematic update of maps in the world, which, for example for topographic map 1:25000 is 5-6 years.¹² Beside stated, new digital topographic charts created in GIS environment, although made with significant digital pace do not possess a necessary print level and availability to secure military objects. To the mentioned fact it is also necessary to add that already made – published topographic charts in digital form have outdated a bit, considering the fact that they were made based on the measurements from 15-45 years ago. In addition to that, significant parts of Serbia's geospace are not covered with geotopographic photo materials, and one part of the completed materials is also outdated. Not enough covered territory and mapping of national geospace as well as outdated content of some of the modern geotopographic material can be seen in Figure 7.

10 Vuletić Ž., Ilić A., Milojević B., (2009). *Model of geotopographic ensuring of police units use during interventions at restitution of public order and peace in large volume*, Security, 51, no. 1-2, p. 331.

11 Milojković, B., Mladan, D., (2010). *Adaptive managing in protection and rescue from floods – adapting to risk of floods*, Security, year LII, no. 1, p. 189.

12 Milojković, B., (2007). *Contemporary geotopographic material for police needs – characteristics and wayd of using*, Security, year XLIX, no. 4, p. 109.

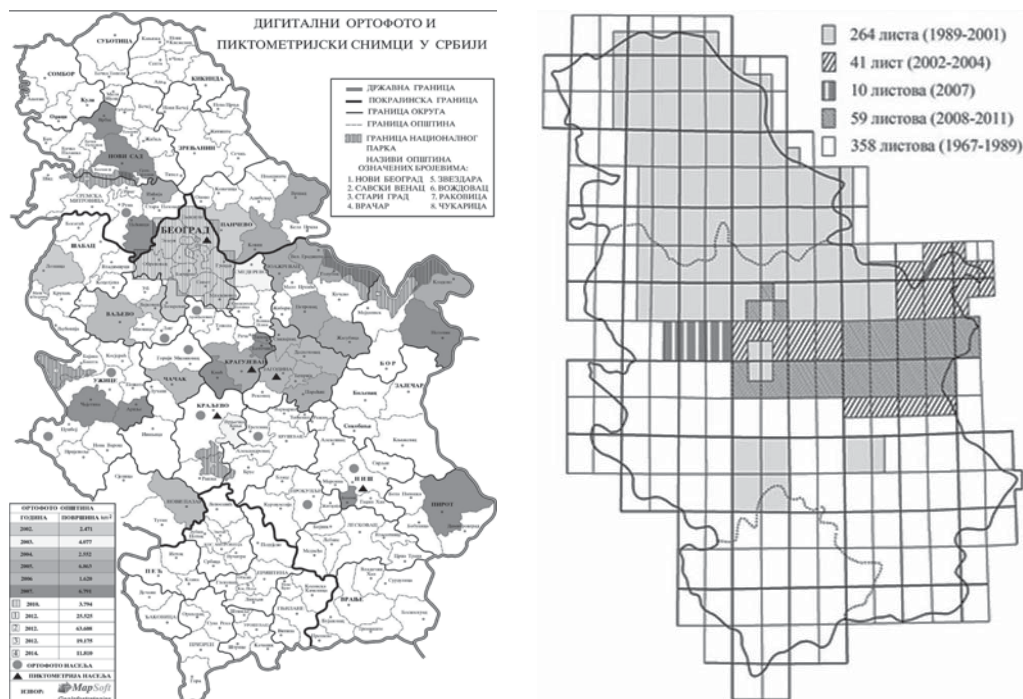


Figure 7 State of content of photographic GTM and topographic map proportions 1:25 000 publication BGI for 2014 (Author – topographic base VGI, 1995)

At the end, a problem of obtaining geotopographic material from centralized cartographic institutions due to limited financial resources of the MoI Republic of Serbia should also be mentioned. The MoI must purchase geotopographic materials – for example one TC sheet costs about 2.200 RSD without VAT. Financial assets for that purpose were not planned at earlier stage so at the moment of restrictive state monetary policy they are even harder to plan.

Beside the fact that dedicated maps and other geotopographic materials are missing, it is evident that not enough professional usage of the existing maps and plans and teaching topographic content are missing in programs of professional education and training. Also, some cards and plans, due to hand production and modest police officer's inventiveness and less familiar private cartographic companies that topographically and thematically model, do not satisfy professional methodological assumptions and therefore have small utility value. To some extent, information about available geotopographic material is absent, especially photographic and digital (satellite recording and other product of digital detecting such as lidar and pictometric shooting – georeferential vertical and aslope air recording, digital orthophoto, photo cards and GIS projects realized for use of specially valuable systems).

The appropriate MoI organizational units recognized the state issued during mid 1990s, but it did not come to complete realization due to lack of material and technical means. The project of implementing GIS technology for use in the Ministry of Interior started ten years ago and is still in the phase of constructing. That means that our police have not yet gained adequate system of geotopographic security.¹³

GEO TOPOGRAPHIC CHARACTERISTICS OF POLICE UNITS USE IN PROTECTION AND RESCUE ACTIONS IN CASE OF NATURAL DISASTERS

For purpose of this paper geotopographic characteristics of providing use of General Police Directorate in actions of protection and rescue of citizens, material and cultural values from catastrophic floods in Obrenovac and Šabac, in May 2014, have been considered.

¹³ Milojković, B., (2014). *Model of geotopographic security in police organization of Serbia*. In: Thematic collection of papers 3, Research project, „Structure and functioning of police organization – tradition, state and perspective“, Police Academy, Belgrade, p. 136.

Namely, after declaring emergency due to catastrophic floods, in the stated local governments' headquarters for emergency situations have been formed, the Headquarter of joint forces for safety and defence against floods. Among other things, graphic documents have been created that for their base had geotopographic materials (Figure 8).

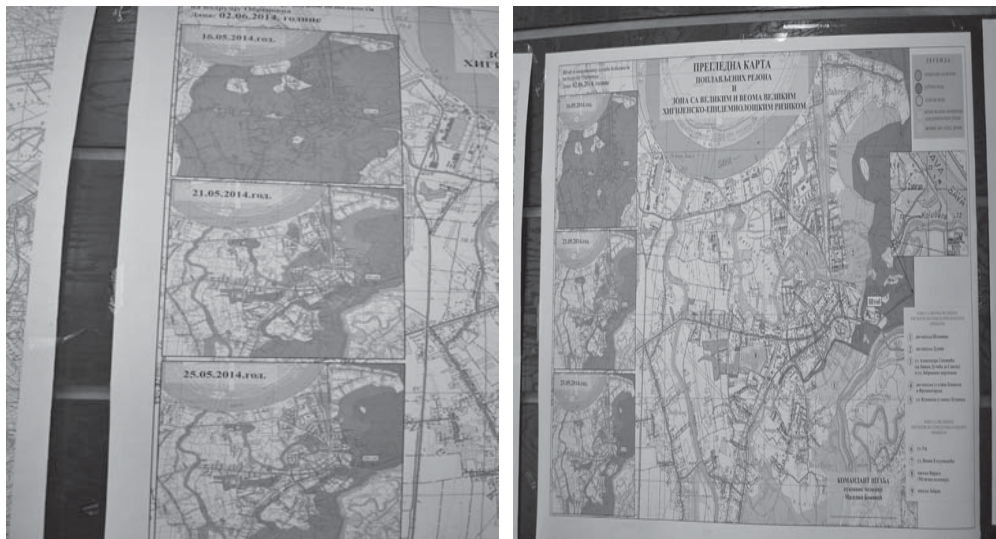


Figure 8 Work chart of Operational headquarters for defence against floods (Topographic base TC 1:25 000, publication VGI 1995)

For purposes of estimating situation as well as for planning and conducting actions of protection and rescue, concretely evacuating endangered people from flooded residential areas, heads in Headquarters used digital orthophoto plans, proportion row of topographic charts publication of Geomilitary institute and satellite recordings from portal "geoSerbia" that were made on 19 and 21 May. Those recordings were produced by French company "Airbus Defence & Space" that deals with production of satellite and cooperates with the Republic Geodetic Institute. Also some recordings made by the Service for managing in emergency situations and mapping "Kopernik" (GIO Emergency Management Service – GIO EMS) were used (Figure 9).



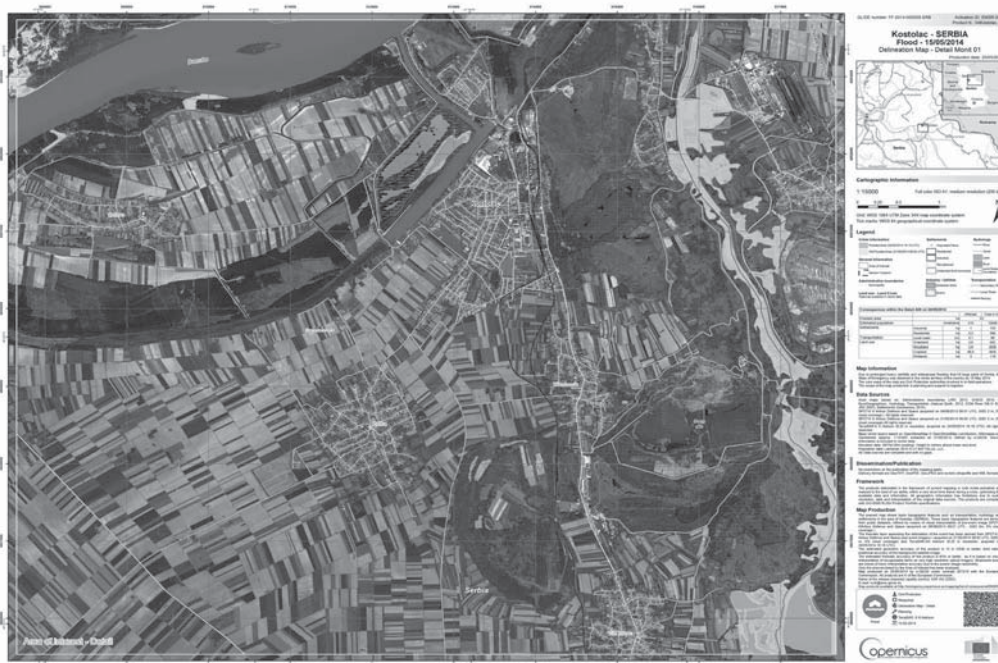


Figure 9 Satellite recordings of flooded geospace – SPOT 6 and Kopernikus
(Source: RGZ and GIO EMS, 2014.)¹⁴

Beside invested effort of commanding officers and experts for geoinformatic technologies, the estimate of endangerment, planning the use of available resources and monitoring the action of protection and rescue were aggravated. Namely, aside the difficulties in flow and exchange of data of the state in the field among the joint forces, modern geographic materials were missing – digital topographic card 1:25 000, thematic cards, digital orthophoto, plans with height of the field and address system, navigational maps, maps of water facilities, Web cartographic products and products of remote detection, etc). The reason for this fact is among other things that the Military Geographical Institute, the Republic Geodetic Institute, public and utility companies – post office, power supply companies, water system, drainage, cleaning of town, city's greenery, etc. made their own geotopographic material and GIS projects but they did not make their results available to the Headquarters for emergency situations, that is, they did not solve the mutual exchange of geospacial database without any fee.

Then, a special problem during the evacuation of the endangered people in Obrenovac lacked geotopographic material with correct address system – house numbers, street names, settlement names – local community and their smaller entities (made by e.g. post office or distribution and utility companies). Also the problem was inability to estimate further flow of the flood due to new flood wave (calculating volume and height of flooded geospace was not possible from digital orthophoto plan because it did not contain the layer of digitally modern field – digital model of height (Figure 10).

There are plenty of examples of the need for specific and purposeful data on the endangered geospace, but it is necessary to mention the limitations in their uninterrupted providing and usage. For example, the Military Geographical Institute for a couple of years is realizing a project of creating digital topographic card proportions 1:25 000 (DTK25) with central topographic database (Figure 11).

The mentioned topographic map was made for 380 sheets from 738 what was necessary in order to cover the national territory of mapping (Figure 7), but it was not available to police officers due to lack of financial funds for their purchase.

¹⁴ <http://emergency.copernicus.eu/mapping/ems-product-component>, accessed 22.12.2014.



Figure 10 Digital orthophoto plan (Source: MapSoft Belgrade 2014.)



Figure 11 Part of digital topographic map 1:25 000 – type of photo card (Source: Military Geographical Institute 2014)

However, beside the mentioned, the police were not able to use the benefits of contemporary geoinformatic technologies. For example, for the needs of geotopographic providing of police grand gesture of use were small UAVs that were suitable for production of photographic and digital geotopographic materials, gathering of geospatial data and their analysis. Those drones are called UAVs – BAS. These are the drones equipped with cameras of high resolution that enable production of orthophoto recordings in visible part of spectrum (RGB) or close to infrared part of spectrum (NIR – Near InfraRed) and digital model of surface in various forms (raster – *grid* model, vector – *tin* model; cloud of dots – 3D coordinates of each pixel) (Figure 12).



Figure 12 *Detection of floods with a help from UAVs „Sensefly eBee“ – Bosut and Jamena*
(Source: Vojvodina waters, 2014)

However, BAS products of recording do not contain quantitative and qualitative data on objects and phenomena in geospace necessary to police in case of natural disasters, therefore integrated implementation of BAS and GPS devices for GIS is needed. For mentioned use the most appropriate are GPS devices for GIS with represent PDAs and GPS receivers. Such gadgets are produced by American company TRIMBLE, and its experts have first made “binding” GPS receiver and a computer with operational system Windows Mobile, achieving easy, portable and strong device to work in the field with accuracy below 1 m with differential correction. At those devices receiver registers positional data, and user puts in attributive data according to pre-defined structure of user’s system (projected codebook). Also, recording of object with a help of camera that makes georeferential recordings and/or connecting with laser telemeter, sonar and other peripheral devices (Figure 13).

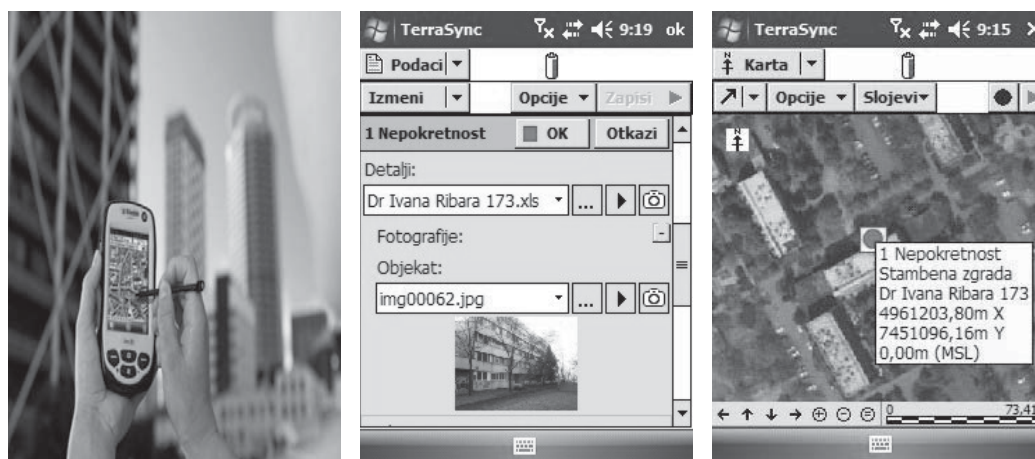


Figure 13 *GPS devices for GIS make TRIMBLE – Juno 3, applicative software for measurement and gathering of attributive data – TerraSync* (Source: Livona, 2014)

CONCLUSION

Natural disasters due to the increasing frequency and consequences, as well as their complexity and unpredictability, are becoming increasingly serious security challenge for the Serbian police. It is unequivocally demonstrated through experience and lessons from engaging units of the Police Directorate in the May floods that have had disastrous consequences. Specifically, in addition to insufficient training and equipment of police officers, there were evident problems in telecommunications security due to the decrease of the energy system, non-functioning of mobile operators and increased demands of a large number of users in a small geographic space, as well as problems in the absence of modern and specific geotopographic materials.

In order to establish adequate providing of police intervention in the future actions of protection and rescue of people, material and cultural values new, flexibly legal, organizational and planning, educational and scientific, materially-technical and financial solutions to maximize readiness for community response terms of natural disasters, are unavoidable.

Among the urgent activities we emphasize the urgency of training programs at vocational education and training that would, among other amenities include teaching in the field of safety and protection from natural disasters (primarily on measures of protection and rescue, risk assessment, preparation of planning documents and training in swimming, first aid, handling of special-purpose equipment and training of police topography). Training should be first implemented at the operating level management, and then with members of the police unit. It is particularly important that a lot of police officers of the Police Directorate undergo training in the first aid and training in swimming, because these competencies may be needed at intervention in natural disasters and in everyday tasks.

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