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DISASTER MANAGEMENT IN PRACTICE – CONCERNING 5TH ICC&GIS FLOOD AND EVACUATION OF 92 PARTICIPANTS

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Abstract

This paper describes lessons learned during the floods in 2014 in Bulgaria where a large group of professionals and researchers working in early warning and crises management (EWCM) got involved. The paper describes the site and the chronological order of the events, which disturbed the Seminar on EWCM, June, 2014.

Due to heavy rain the conference participants got isolated in a flooded area. The National Programme for Disaster Protection provided information but could not help in the crisis situation. The emergency telephone line was open and online forecast information was available but the conference organizers were not aware of any procedures how to deal with crisis situations. The maps and images of the area were not available before and after the event.

Triggered by these events, we discuss the need of better preparedness in detail. We propose a number of maps that we believe need to be prepared and made available to citizens in similar situation. The maps are classified and their properties are discussed in detail. A map, based on satellite images, was produced by Copernicus project after the event. We elaborate on its content, aim and usefulness.

We emphasize on the need of a better cooperation and exchange of information between professionals in the field and regular citizens. Two types of information streams are considered: from the responders to the citizens and from the citizens to the responders. We conclude the paper with suggestions for future improvement of the preparedness of organizers of big events.

Keywords: *flood, crises management, mapping natural disasters, disaster in practice*

INTRODUCTION

Bulgaria is often affected by a large number of and with strong intensity disasters such as flood, storm, industrial accidents, and earthquakes. The country falls into areas characterized by having high hazard risk (Council of Ministries, 2013b).

Over the years, and particularly during the last 10-12 years, Bulgaria was frequently affected by natural and man-made disasters that caused considerable losses. Various natural disasters, like landslides, floods, earthquakes, snowstorms, windstorms and thunderstorms, drought, hailstorms, freeze, extreme temperatures, etc. are manifested on the Bulgarian territory (Pashova et al., 2010; National Statistical Institute, 2015; EM-DAT, 2015). National Statistical Institute (NSI) registers also accidents, pollutions, epidemics and other. For the period 2003-2013, NSI registered a total of 44 472 disasters. Percentage distribution of the natural disasters for this period (excl. 2009) is shown on Figure 1. The number of natural disasters was 12 584 and their average number per year was 1 258. As a result of these disasters many casualties, injured and affected people were recorded (Bandrova et al, 2015).

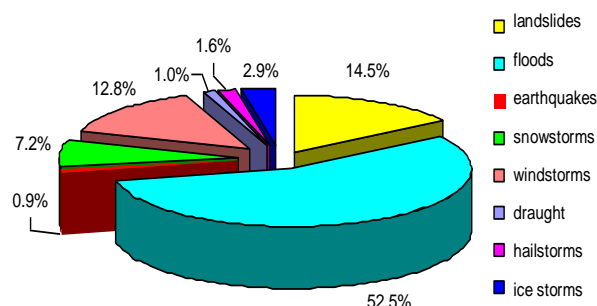


Figure 1. Percentage distribution of different natural disaster that occurred in Bulgaria for the period 2003-2013.

Recognising the important of these events, a "National Programme for Disaster Protection the 2014-2018" (Council of Ministers, 2013a), approved on 7. May 2014- just a month before the flood, definitions of operations in flood situations. The Law on Disaster Management as well as descriptions of the procedures which should be obligatory completed by responsible institutions were also approved. Since 2009 an early warning system has been working and it is used for decision support of executive authorities. It offers voice guidance to people. Unfortunately, this system is not always working. For example, during the flood event of 2014, it was not activated in the area of Varna. The citizens had to call to emergency phone 112 for giving information about the disaster.

In 2014, June, 15-21 the 5th ICC&GIS Conference was held in one of Black Sea Bulgarian resorts, Riviera. The weather conditions were unstable and rapidly changing but the scientific programme was interesting and the conference organisers were very optimistic that the weather will not influence the conference. Traditionally, during the conference a Seminar on Early Warning and Crisis Management (EWCM) is organized by the Commission on cartography for EW&CM of the International Cartographic Association (ICA). Many specialists from different countries presented their research and results during the Seminar sessions. The head of Aerospace Monitoring Center (Remote sensing Center - Ministry of Interior, Bulgaria) also participated in the conference. A keynote was presented also by the leader of a research group "Geo-information for Crisis Response" at the GIS Technology section, TU Delft. The conference was following the programme and nobody expected that the Gala dinner will bring a life-experience disaster to many participants. After several hours continuous rain, the Gala dinner participants realised that the only road was destroyed and the water level jumped up several meters in few hours.

THE PLACE AND METEOROLOGY

The place, where havy rains started and continued more than 24 hours, is located in Bulgaria, north-east region of Varna city. Varna city is situated on north part of Black Sea cost of Bulgaria, $\phi = 43^{\circ} 12'$ and $\lambda = 27^{\circ} 55'$ (see Figure 2). The dinner place was in Prilep village (see red area of Figure 2), 40 km north from Varna and 20 km west from Albena resort. The terrain is hilly and elevation is about 250 m. The forest area and also fields with agricultural production are around the village. Close to the place the terrain is appropriate for helicopter's landing (see Figure 4-right).

In the region, Batova River flows in a wide valley, ultimately flowing directly into the [Black Sea](#). The Batova River is 39 km long, but it is notable as the only river in [Southern Dobruja](#) that does not run dry on an annual basis. The river is deep between November and May, with a peak in February, and shallow during the remaining five months, particularly in July and August. The Batova's [drainage basin](#) covers 339 sq km and its average flow is 340 litres per [second](#) (Bozhinov T., 2016).

The infrastructure is not well kept and roads are not in good conditions.

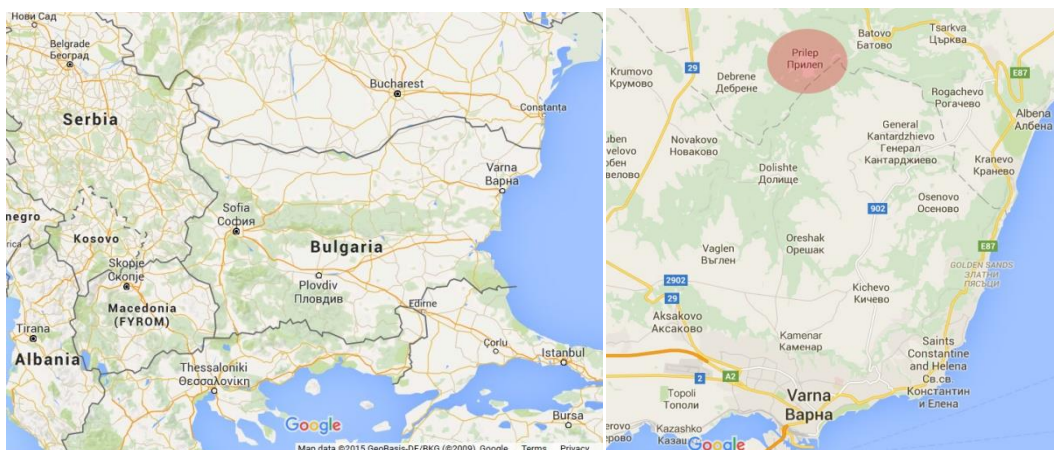


Figure 2. Map of Bulgaria and Map of North-East part of Bulgaria with the place of disaster, GoogleMaps



Figure 3. Batova River (photo is taken by Nikolay Syoykov) and Flooded areas of Prilep village and Varna region

In the days leading up to the event, large parts of the country had been battered by heavy rain and hailstorms (Figure 3 and 4). On June 18, the Varna office of the country's forecasting service (NIMH) sent an official memo to the local administration warning of intensive rain and hailstorms on the following day. According to the NIMH, the average discharge of 24-hours for Varna Province was between 60 and 85 l/m², while in neighbouring Dobrich Province it was from 90 to 155 l/m² (Our place is situated between both provinces). The average discharge amount for the whole month of June is around 50-60 l/m². A single weather station in the north of Varna recorded discharge values of 35 l/m² in a two-hour period between 6pm and 8pm on June 19. In the far north-eastern parts of Bulgaria, rainfall rates reached 140–200 mm/h. On June 20 the NIMH warned that further rains up to 20 l/m² (Figure 4) could be expected throughout the weekend (NIMH, 2014).

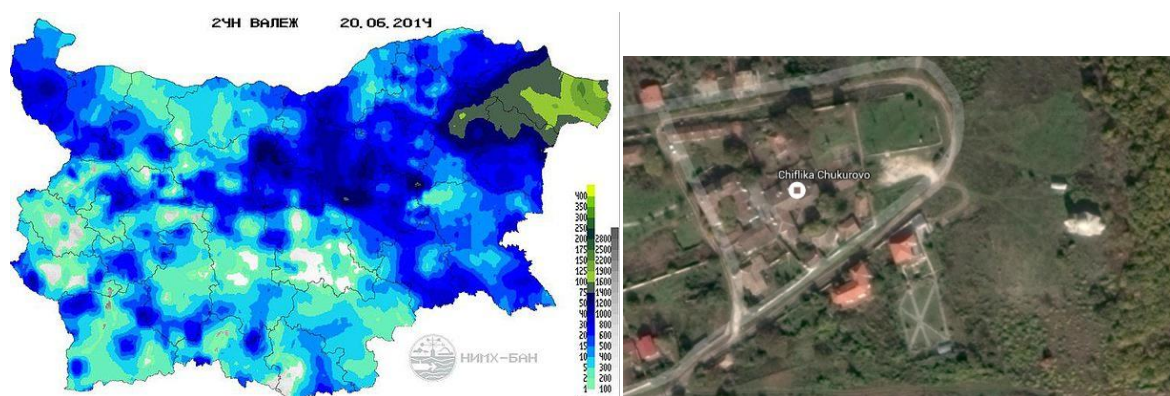


Figure 4. The quality of Precipitation of Bulgaria for 20.06. 2014 (BAS) and aero photo image of the place of disaster

DESCRIPTION OF DISASTER SITUATION

The first signals for the high level of the river came from the folklore group, which gave a performance at the conference differ. They left the restaurant with the intention to go home, but they came back because the river level was abnormally high covering complete the road. It was impossible to estimate the road condition in the dark. Very quickly

became clear that the conference participants have to stay at the location until the morning. This decision of the conference organisers created already quite some tension:

- Because all participants expected that they will be on the place only for 3-4 hours for Gala-dinner, most of them did not take their belongings: medicines, warm clothes, accessories, money, etc. The largest concerns were for people with chronic diseases, facing possibly long time without their supportive medicines;
- The place of the conference dinner was a relatively small resort that could accommodate a part of the participants. Therefore alternatives should have to be found in a very short period of time;
- The restaurant was not prepared to provide extended meals for several days. A very careful counting on the existing food had to be performed the same evening;
- To calm down the participants, a connection had to be made official institutions and to get actual information on the range and severity of the flood;
- Many of the participants had to travel back and considering the situation, a decision had to be taken which flight had to be cancelled.



Figure 5. Flooded areas of Prilep village and Varna region, photos from Reuters and AP

In the following 20 hours a lot of measures were taken. The congress organisers took the initiative and formed a local 'disaster management center' that kept in contact with the needed institutions. They organised hotel accommodation for most of the people in the nearest neighbourhood. It was needed to divide the food on small portions as much as possible to keep 100 persons in healthy conditions. They look for online information from local meteorological services; we had permanent connection with the emergency phone 112 and many logistic connections to the airport concerning change of already booked flight tickets. They have also established a special connection with Czech Embassy in Sofia and Consulate in Varna which provided supportive information. Fortunately the TV and internet were working. The participants soon could observe by themselves the effect of the flush flood and the damages in one of the Varna neighbourhoods (Figure 5).

Thanks to all actions, the conference participants could have good rest and reasonable meals during the following day. The weather situation did improve slightly, the rain stopped, but the river level was still very high. On a day light it became clear that the road is destroyed and it will be not possible for the busses to go back. After several phone calls with the emergency crisis centre in the area, two helicopters were sent to the restaurant (close to Prilep village) to transport the participants to a dry area, where several busses were waiting (Figure 6 and 7). All the participants were safely brought back to the conference hotel. The sessions of the last day were cancelled, but the researchers had the chance to exchange many ideas and discuss what has been done and how it can be done better during these 24 hours in isolation.

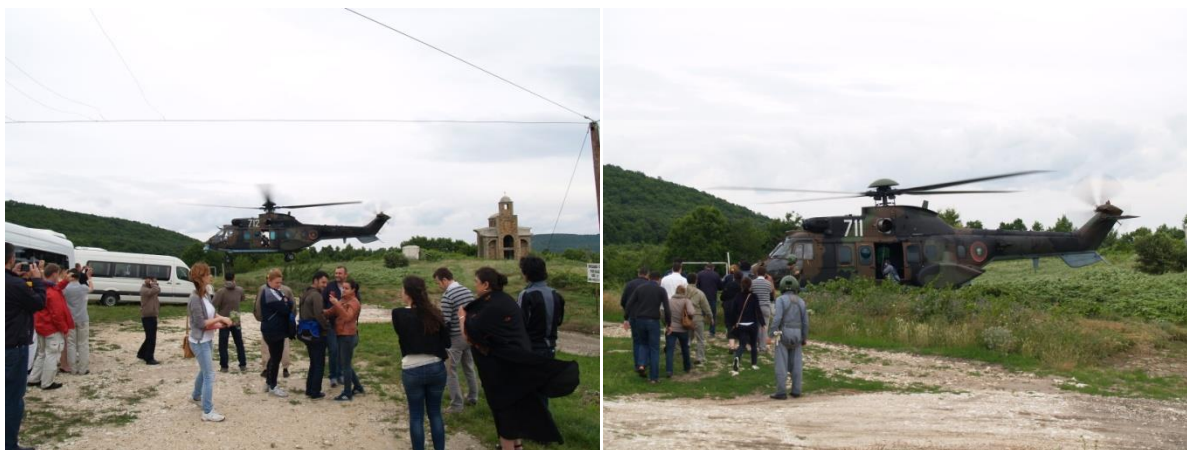


Figure 6. Action for participants' evacuation

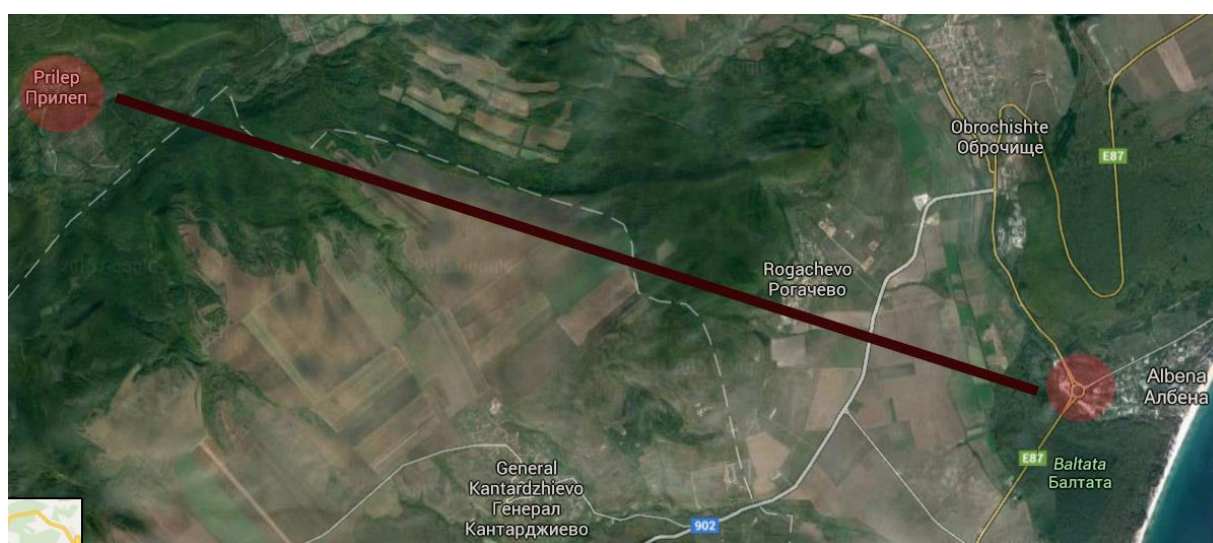


Figure 7. Distance for evacuation by helicopters – 10 km

HAVE WE BEEN READY FOR DISASTER SITUATION?

Bulgarian legislation related to ensuring the protection of life and health, the environment and property in case of disaster is permanently updated in accordance with international and EU requirements and standards in this field. The roles of main actors are regulated by a number of normative documents: Law on Disaster Protection, Law on the Ministry of Interior (MoI), National Plan for Disaster Protection and National Action Plan, National Program for Protection in Disasters, Regulation on terms and conditions for the functioning of the National System for early warning and alert, Strategy to reduce the risk of disaster, etc.

But the disaster lessons have clearly shown that the people are not sufficiently educated and trained what to do and what is the proper behaviour, when a disaster happens (Bandrova et al, 2015).

United Nations International Strategy for Disaster Risk Reduction (UNISDR) recommends to extent disaster risk reduction as identify it as a political responsibility and greater sustained commitment to the support of long-term national development objectives can be obtained (UNISDR, 2006). This could be next task of Bulgarian administrative offices after publishing of legislation normative.

ARE WE READY AFTER 2 YEARS TO MAKE BETTER MANAGEMENT?

To respond of the questions authors decided to use as a background (Figure 8, Nagy-Rothengass M., Schouppe M., 2008) Framework EU schema for Disaster Management Cycle. The cycle was created to define many steps in disaster management and aims to big scale disasters. But all that steps influence also local situation. We look for our problem mainly from local or regional point of view, so we are unable to react or describe some topics in the schema, which are

part of complex solution in the big territories. Therefore in this paper, the authors address only several points related to the experiences of the Gala-dinner floods in 2014.

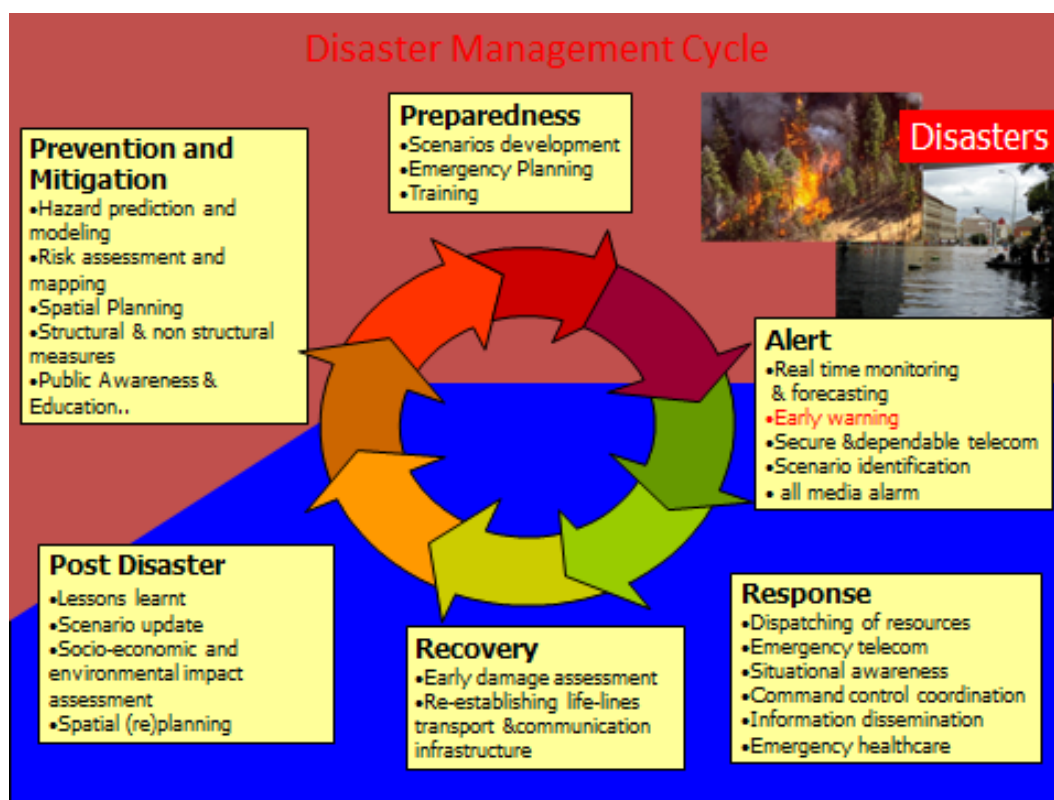


Figure 8. Disaster Management Cycle (Nagy-Rothengass M., Schouppe M., 2008)

Prevention and Mitigation

If we think back what happened from the position of individual participants, it is the only real base for everybody from us to design some knowledge for the future, but knowledge is limited just for floods situations. The understanding of all of us was, we go for several hours limited event. By the time we were in the restaurant, strong flash floods blocked area of several cities and villages. We were informed that the only access road back to conference place is closed due to rising in rivers' water levels. Unexpectedly, we had to spend the night in the manor where we got very simple accommodation. During the evening and in the morning we contacted emergency services in Bulgaria, embassies of the participants with health problems, civil protection services.

We have seen many other floods on TV, but it is the human nature that does make us think that such disaster could not happen to us. Shall we try to take measure all the time we go somewhere for few hours? Perhaps not, because we don't know what and where something might happen. But it is very important to be prepared that we are vulnerable and be calm and be not plenteous. However it is very important to be aware that certain risk exists and these risks have to be well modelled and exhibited to citizens. If we take just two items from Prevention and Mitigation part of Cycle, we can conclude that Hazard prediction and modelling should be done better. For example, risk maps can be created for the areas that are prone to flush floods; webcams can be installed at key places to observe river levels and model the risk of flood.

Risk assessment and mapping are possible to do today with assistance of social media. But inhabitants of the village were also under stress from the flash flood. Mapping should be possible with help of mobile phones and GPS, online satellite or aerial images in appropriate details. We did not use all these potentials because of missing IT equipments, night time and not enough and complex information about the situation.

Preparedness

Scenarios development should be done on such places or regions and practical steps should be planned for different levels of public administration. Some years ago regional administration recognized hazards and risks in the places of the biggest damages but good ideas and plans were not realized. This was the reason of 12 death casinos in Varna on 20.

June 2014. At least awareness should be kept for the future with a hope that main reasons of such bad results will be removed. A real and helpful scenario should be created. Emergency Planning steps should be defined and inhabitants should be prepared to live with future coming hazards and risk. For examples routes for safety evacuation should be clearly indicated or at least dry areas should be communicated to citizens well in advance.

Alert

Real time monitoring & forecasting have not been realised. It was the reason that participants had face many questions such as 'shell I try to find a way by foot', 'shell I cancel my flight', etc. As mentioned previously, very sparse information came to inhabitants mostly from TV channels or via direct phone calls. For example information about flooded areas was collected by local people having information about the terrain. In two years, the situation improved significantly and regional meteorological service is offering permanent on-line information about meteorological and hydrological situation. It is still to be seen if the information about the range flooded areas has been also improved.

Early warning as a part of Alert in the Cycle is situated at un-appropriate place. In nowadays it is relatively independent activity which is still loosely linked with disaster risk management. The basic rules of EW have been defined in Hyogo conference in 2005 (ISDR, 2007) as an instant reaction for tsunami in Asia in end of 2004 year. In Hyogo Framework for Action a new approach of EW is defined. It was highlighted that EW has to be People-Centred system oriented with the objective to empower individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life, damage to property and the environment and of livelihoods. To be effective, early warning systems must integrate four elements: 1. Knowledge of the risks faced; 2. Technical monitoring and warning service; 3. Dissemination of meaningful warnings to those at risk; and 4. Public awareness and preparedness to act.

Failure in anyone of these elements can mean failure of the whole early warning system. Sendai UN Conference on DRR in 2015 (after our experiences) found that principles as a well done.

In the future would be appropriate to develop and enrich early warning process and solutions by social media information.

Response

The response phase is the most important phase in the whole emergency response cycle as disaster strikes by surprise. In our case, the rain and the flood was not life threatening. The manor was on a quite high spot in the mountains. The biggest and serious problem was the fact that medicaments were missing for about 7 participants who needed them for various health reasons. An option was investigated to deliver only the medicaments for these participants, but in the first hours it was no chance to arrange such transport. These people were given least psychological support. Contacts with doctors were arranged by honorary consul of Czech Republic in Varna. Those doctors gave recommendations what and how to do till the time medicaments will be delivered.

As it our experience showed, the on-time and accurate information about the event and the people in the group is very important. In our case situational awareness was realized by the help of Bulgarian emergency link 112, TV, Web, regional hydro-meteorological service and mainly individual contacts of participants with unique connections and information. Some colleagues went to collect information about possible evacuation in opposite direction, but it was difficult and without any results for possible evacuation. Options were investigated to cross the critical flooded area by foot and get to not affected roads, as the water level was decreasing. But in our group were several seniors unable to cross water by walking, as few participants did. In such situations it is extremely important to be aware of the event, but also about the people involved in this event. For examples, we have a case when participant left the manor without informing the conference organisers.

Information dissemination to members of group was done in short intervals of time when we got it. We discussed problems in smaller groups or individually and tried to kept high spirit of the people.

Post Disaster

The post disaster phase for our event was more related to financial aspects and analysis of the event. In our small disaster management team we have identified several lessons. We also recognise that psychological human cooperation should be structured as well, for example: one to one, one to group and parts of groups to other parts ones. In our case, most of the participants cooperated actively to solve problems of psychological character.

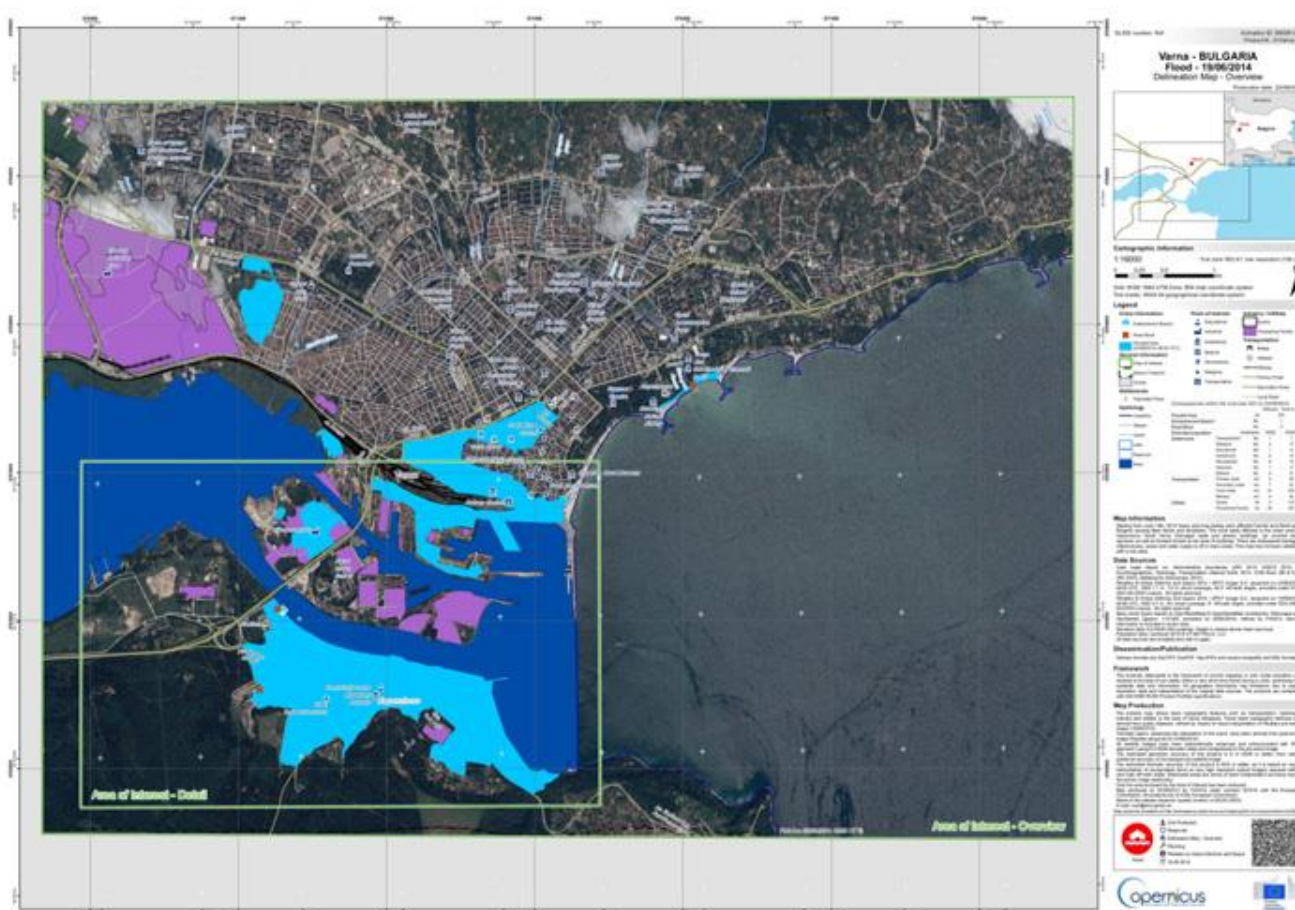


Figure 9: A map, representing the most severe floods in the city of Varna, fusion of Spot images (23/06/2014 and 19/09/2013), Open Street Map, EU-DEM (2013), Administrative boundaries (2013), Hydrology Transportation (2012), Settlements (2013) (prepared by ITHACA)

LESSONS LEARNED

Authors think that our local knowledge could enrich and be used in development of ideas defined by UN Disaster Risk Reduction (DRR) conference in Sendai, in 2015 (UNISDR, 2015). The conference developed wider ideas of just Disaster Risk Management into DRR and put attention mainly to 5 priorities: Priority 1: Understanding disaster risk. Priority 2: Strengthening disaster risk governance to manage disaster risk. Priority 3: Investing in disaster risk reduction for resilience. Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

Between others in Priority 1 "Understanding disaster risk" there are topics for improving DRR in future years on national and local level, e.g. to develop, periodically update and disseminate, as appropriate, location-based disaster risk information. There are requests to design and improve risk maps to decision makers, the general public and communities at risk of exposure to disaster in an appropriate format by using, as applicable, geospatial information technology; e.g. to promote real time access to reliable data, make use of space and in situ information, including geographic information systems (GIS), and use information and communications technology innovations and last but not least, to enhance measurement tools and the collection, analysis and dissemination of data. Similar requests have been formulated for global and regional levels (UNISDR, 2015).

It was also asked to promote and enhance access to and the sharing and use of non-sensitive data and information, as appropriate. Established communications and geospatial and space-based technologies and related services; maintain and strengthen in situ and remotely-sensed earth and climate observations; to strengthen the utilization of media, including social media, traditional media, and big data; to use mobile phone networks, to support national measures for successful disaster risk communication, as appropriate and in accordance with national laws.

It is very important to educate citizens that disasters can happen even in the areas which are not vulnerable to any hazards. It could be as a result of weather extreme or human intervention or malfunctioning. This awareness can be

achieved by more interactive and convincing way than boring information evenings about how many packages of sugar and beans you should continuously at home. Interactive methods work much better than lectures for community training, especially when combined with practical examples, simulation, and role play — no lecturing!

It is not a surprise that Radio and TV Soap Operas are a very effective way to change listeners' attitudes and behaviour. They touch humanity and are built upon daily situation that are understandable and close to regular citizens. Such forms for education can be used to explain and make aware of disaster hazard. It is very important to start this education at a very early level. The point is to educate and to scare. The education should start from childhood and to encourage their interest in hazards and mitigation from early age.

After the 2014 Gala dinner event and the following discussions and analysis we conclude with several recommendations:

- Having information about the disaster and the affected area is very important. If information is provided the people can estimate their own situation and can wait for help or decide to take action by themselves. Lack of information is dangerous and might be even life threatening. Visual information about flooded areas (as in Figure 3) could be very helpful. In this respect maps provided by international organisation (even approximate) might be critical in the first hours to get understanding about size of the event (as in Figure 9). Channels providing such maps should be monitored.
- It is critical to involve local communities in the development of emergency preparedness plans and disaster mitigation measures according to their social and education status. In the area we were, most of population was quite aged. These citizens can hardly understand digital maps, but they have a mental map of their region. They have to be educated with respect to their mental map. They can be also educated and engaged to operate and maintain simple and practical early warning systems.
- It is important to investigate and record the community's social memory of local hazards. This knowledge is forwarded from generation to generation and can be used to understand hazards and promote attitude changes and disaster mitigation activities.
- All preparedness and emergency activities have to be in compliance with local knowledge and traditions. Lecturing has to be replaced with more vital forms of communication, such as theatre or advanced forms of visualisation (Bandrova et al 2012, Zlatanova 2008, Zlatanova and Holweg 2004, Zlatanova and Bandrova 1998)
- It is very important to use existing structures and partnership relations, especially when they are trusted. In emergency situation people tend to rely on trusted contacts.
- Last but not least, it is critical to rely on informal leaders, but knowledgeable and willing to help. Establishing relations and understanding with them guarantees success of interventions.

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BCA President Prof. Bandrova and BCA Vice-president Col. Gladkov presented awards to the crew members of the helicopters from Krumovo military airbase. 92 participants from more than 20 countries in the 5th International Conference on Cartography and GIS were successfully evacuated after spending a night in a flooded area near to Varna, Bulgaria.

We would like to thank to all participants for their patience in not easy situation for them, for organizers and all people included in solving the problems acquired during the time of disaster situation.

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BIOGRAPHY



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