

CHALLENGES IN FLOOD RISK MANAGEMENT IN BOSNIA AND HERZEGOVINA

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Received: 4th August 2022

Accepted: 17th August 2022

Review paper

Abstract: Bosnia and Herzegovina is a country with a very high risk of floods, which is documented in Vulnerability assessment, where it is defined that "floods represent the greatest danger for community and its population". Due to climate changes in recent decades, floods have become one of the most serious forms of threat to the population and material assets.

After signing the Stabilization and Association Agreement with the EU in 2008, BiH accepted obligation to harmonize its legislation with the EU *acquis communautaire*, which also includes water legislation. The complex constitutional arrangement and unfavorable socio-economic situation make it difficult to fulfill assumed obligations, as well as protection and rescue system normal functioning on state territory.

This research subject is protection and rescue system analysis, assessment of the adequacy of existing measures and current flood risk management techniques in BiH through a comparative analysis with practice of flood risk management in the EU.

Key words: flood risk management, protection and rescue, complex governance structure

1. INTRODUCTION

Bosnia and Herzegovina (BiH) is a country rich in surface and underground water where, as a result of global climate changes, in the last two decades floods have become one of the most frequent and serious threats to the population and material goods. After signing the Agreement on Stabilization and Association with the European Union in 2008, Bosnia and Herzegovina is obliged to harmonize its regulations with the EU *acquis*.

One of the directives that forms the core of the EU *acquis* in water protection field is Directive 2007/60/EC of the European Parliament and the Council of October 23, 2007 on assessment and management of flood risk (Directive). This Directive defines methodology for flood risk management plans creation and measures to prevent the impact of floods. It also confirms public rights to access information and to participate in planning process. The implementation of the Directive is mandatory, although this issue is primarily a domestic priority and is not

conditioned by the requirements of the EU acquis, to a certain extent it must be implemented urgently (Environmental Approximation Strategy of Bosnia And Herzegovina EAS – BiH, 2017). The EU Directive did not provide instructions or strictly defined a model for flood risk management. Respecting the different state regulations, it gave each state the right to choose the best way to manage flood risks.

In January 2015, the Council of Ministers of BiH adopted the Action Plan for flood protection and river management.

At the BiH level, the Framework Law on the Protection and Rescue of People and Property in the Event of Natural or Other Disasters in B&H has been adopted ("Official Gazette of BiH", No. 50/08), and protection and rescue system management at the state level is reduced to the coordinating positions of the highest state bodies in relation to two Entities and one District. The legal framework in Bosnia and Herzegovina's water sector is harmonized with the constitutional organization of BiH, and consists of: the Constitution of BiH, Entities constitutions, Brčko District of Bosnia and Herzegovina (BD) Statute, laws and by-laws adopted at the level of the state, Entities, District, cantons, cities and municipalities.

Floods that have occurred in Europe during the last 2 decades have shown all destructive power that this natural disaster can have. Countries that had an inadequate and inefficient protection and rescue system suffered the greatest damage or needed the longest time to recover.

In this paper, a comparative analysis of the structure and effectiveness of protection and rescue system in context of flood risk management in BiH - a transition country, and the Republic of Croatia - a member of the European Union was carried out.

2. PROTECTION AND RESCUE SYSTEM

Protection and rescue system at the level of BiH is regulated in accordance with the Framework Law on the Protection and Rescue, which defines principles and framework of protection and rescue system. The principles of cooperation and international cooperation in this area, as well as the system of coordination and competence of individual bodies in protection and rescue system, are also defined.

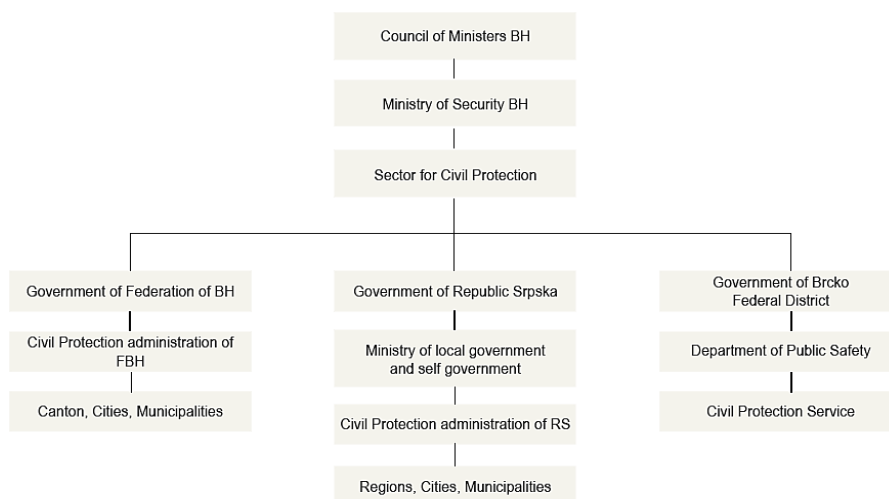


Figure 1. An overview of the protection and rescue system in Bosnia and Herzegovina
Source: (The Structure, Role and Mandate of Civil Protection in Disaster Risk Reduction for South Eastern Europe)

The first elements of protection and rescue system at the state level in BiH appeared in 2003 with the Ministry of Security of BiH establishment, which was entrusted by the Council of Ministers with the mandate to coordinate protection and rescue in the country. Through the Protection and Rescue Sector, this Ministry performs professional and other administrative tasks in this field. At the state level, the Coordinating Body of BiH was established as a professional operational body of the Council of Ministers. It has a primarily coordinating role at the state level and coordinates protection and rescue activities throughout the state, while lower levels are in charge of management (Figure 1). Within the framework of the Ministry of Security, the Operational Communication Center-112 was established. The second level of the organization is actually the operational level, which consists of the Civil Protection authorities of the Entities and the BD.

During the disaster, it is often impossible to adequately respond with own assets, so international assistance is necessary. The Council of Ministers of Bosnia and Herzegovina decides on request for international assistance at the proposal or request of the Coordination Body, the Ministry of Security, competent authorities or institutions of Bosnia and Herzegovina, Entities and District.

In the Republic of Croatia (RH), the Civil Protection service has been an integral part of the Ministry of the Interior since 1994, and what can be singled out as a significant period in protection and rescue system evolution is year 2005 when the State Protection and Rescue Administration (DUZS) was established, and 2018 when the Ministry of the Interior took over the DUZS tasks (as the central body of the state administration responsible for civil protection tasks). On the way to full membership in the EU, Croatia had to pass new legislation, and implement all EU regulations, standards and principles in civil protection field and thus build a European model of civil protection.

Activities in protection and rescue system of the RH are regulated by the Civil Protection System Act (Official Gazette 82/15), and its amendments from 2018, 2020 and 2021. This Law regulates the system and operation of civil protection, the rights and obligations of the state administration, local and regional self-government units, legal and natural persons, as well as training for the needs of the civil protection system, financing, administration and inspection supervision.

The civil protection system is set up on three levels, i.e. local, regional and state in order to connect resources and abilities of participants, operational forces and citizens into one whole with the aim to reduce the risk of disasters, also to provide a quick and optimal response to threats and dangers, and mitigation of major accidents and disasters consequences.

In 2005, the DUSZ was established in the Republic of Croatia to prepare, plan and manage operational forces, and coordinate the activities of all protection and rescue entities with the help of its regional offices in all counties and the city of Zagreb together with its central body.

In 2019, the Directorate of Civil Protection was established in the Ministry of the Interior following the Government's decision to abolish the DUZS. This decision was made after an analysis of civil protection, where „the need for a unified system of leadership and command in major accidents and disasters, faster information flow, normative regulation, enhanced preventive and educational activities, early warning system improvement, division of roles and responsibilities for effective civil protection system functioning from the state to the local level.” (www.civilna-zastita.gov.hr).

The new organization aimed to raise the level of system functionality, and to eliminate perceived deficiencies through linking functional areas, positioning the CP system in the

concept of homeland security, and strengthening the personnel structure and material equipment.

1. COMPARATIVE ANALYSIS OF FLOOD RISK MANAGEMENT IN BOSNIA AND HERZEGOVINA AND REPUBLIC OF CROATIA

Bearing in mind increasingly frequent occurrences of extreme hydrological conditions that increase the flood risk in many areas both in BiH and the RH, as well as the necessary cooperation for certain transboundary watercourses, a comparative analysis of the protection and rescue system functioning through flood risk management was carried out. Considering that one state is a EU member and the other one is trying to become a member, the structure and functionality of two protection and rescue systems were analyzed. Two specific local communities were chosen for research sites as very representative in terms of pronounced flood risks and floods recorded in the past: Zivinice in the FBiH, and the municipality of Gunja in the RH.

3.1. Flood risk management in Bosnia and Herzegovina

Bosnia and Herzegovina, which consists of Entities: the Federation of Bosnia and Herzegovina (FBiH) and the Republic of Srpska (RS), and the special administrative unit Brcko District of Bosnia and Herzegovina (DB) has a very specific system of water law in relation to neighboring countries with a unique system of legal norms governing water management. Contrary to contemporary, globally accepted beliefs of science and profession that water knows no borders, and that waters are managed at the level of the river basin, as well as that administrative borders should not be an obstacle to the development of such management systems, a management system based on the opposite principles has been developed in BiH.

Jurisdictions for water management are in accordance with the Constitution of BiH and the constitutions of the Entities, as well as the arbitration decision on DB, under the jurisdiction of the Entities and the District (Water Management Strategy of the Federation of Bosnia and Herzegovina (2010 - 2022)).

In both Entities, the Water Law has been adopted, and in DB the RS law is being applied, while a new law is in the adoption phase. Operational flood defense plans are being adopted by Entities ministers from competent ministries, and in BD by the Government. In accordance with the constitutional and legal framework of the FBiH, water management issues are responsibility of the Federation and cantons. According to the FBiH Constitution, the Federation and cantons bodies have joint competence in regulating environmental protection policy and use of natural resources (Article 3 of the FBiH Constitution). Water regulations in the FBiH are adopted at the level of the Federation and cantons. According to the FBiH Water Law (Official Gazette of the FBiH, no 70/06), there are two agencies: the Sava River Basin Agency, with headquarters in Sarajevo; and the Adriatic Sea Watershed Agency, with headquarters in Mostar.

BiH has its own dynamics of creating circumstances and fulfilling the legal prerequisites for taking over and implementing the Directive on assessment and management of flood risk, which for FBiH is shown in Figure 2.

In the FBiH, key steps and activities from the Directive were taken over by the Regulation on types and contents of plans for the protection against harmful effects of water (Official Gazette of FBiH, no. 26/09).

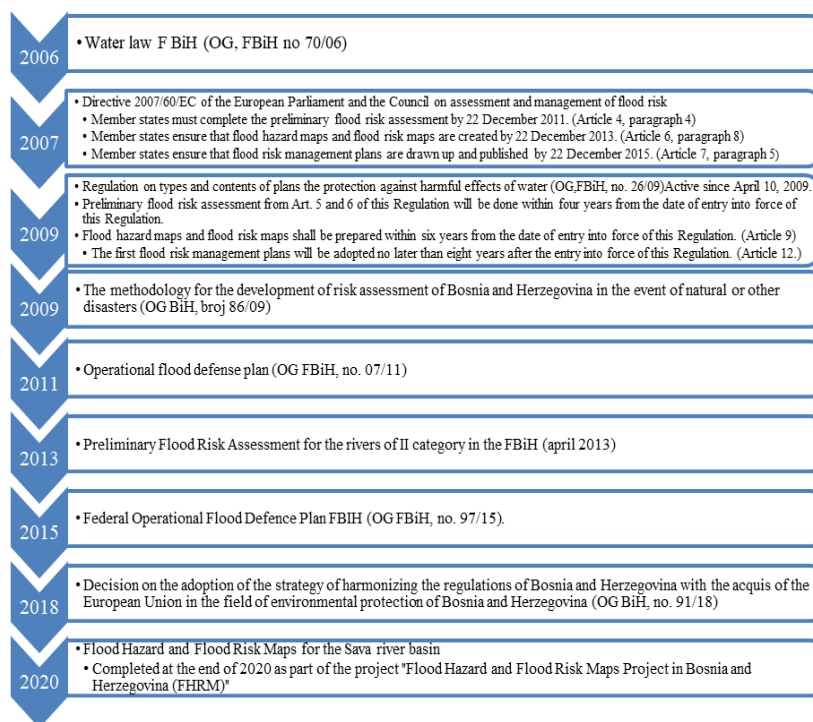


Figure 2. Schematic representation of the adopted regulations

The structure of the country and the legal framework contribute to the fact that current approach to planning preventive measures is not efficient, since there is no complete and clear division of activities at the Entity and Cantonal levels of government, and they are not harmonized in one river basin. The State of Bosnia and Herzegovina does not have a single methodology by which all activities could be harmonized, which makes it difficult to implement measures and activities.

There are also problems in preventive measures implementation because sufficient funds have not been invested nor have they been adequately distributed between different levels of government. The determination of priorities is decentralized, and due to the division and dispersion of responsibilities in Bosnia and Herzegovina, they are difficult to determine.

Due to inadequate coordination between competent authorities, situations occur where cantons are waiting for orders from the federal ministry responsible for water management and the Agency, and the federal ministry and the Agency are waiting for information from the cantons. Such cooperation and communication is inadequate, more precisely, it is not in accordance with good practice, and good practice is the basis for integral planning in the river basin.

How complex BiH is also shown by the event of May 2014, when unprecedented floods occurred, which took lives, caused great material damage, and activated thousands of landslides. The chronology shows how late the authorities were one after another in declaring a natural disaster: the Government of FBiH declared a state of natural disaster on May 15, 2014, on the territory of FBiH, while the Government of the RS declared a state of emergency only on May 17, 2014 on the entire territory of RS, while state of disaster has not been declared on state BiH level.

In its Progress Report from 2013 (<http://www.mvteo.gov.ba>), the European Commission assessed that the lack of real political support for BiH's EU program results in very limited progress in terms of harmonization with EU laws and standards.

3.1.1. The city of Zivinice (FBiH) in the floods of 2014

The City of Zivinice is located in the northeastern part of BiH. The city itself has approximately 10,500 inhabitants; the greater area covers 291 km² and at the end of 2013, about 57,762 inhabitants lived there. Larger rivers that flow through this area are Spreca, Gostelja and Oskova, and among the smaller ones, Toplica is important. During heavy rainfalls, many of them leave their beds, and flood surrounding areas. Total area of the water courses is 7.40 km² or 2.54% of the total area, and the total length of all the courses is 109.8 km. The Spreca River is 83.6 km long, of which 30.3 km passes through Zivinice. It has a characteristic water regime, nival - pluvial. It is a distinctly lowland river that forms a funnel-shaped delta at its confluence with Lake Modrac. The problem of underground water level is related to „Sprecko polje“ area.

In the spring of 2014, weather-extreme occurrences of the highest water levels on all watercourses were recorded, which reached the historical maximum of daily precipitation recorded at the Tuzla measuring station. In addition to heavy rainfall, following factors also had a major impact on floods:

- Many years of continuous filling of Lake Modrac with coal dust and river drift, which significantly reduced receiving volume of the reservoir,
- Illegal construction of buildings on the watercourses or expansion of individual households at the expense of narrowing the watercourse and filling up the banks,
- Insufficient river courses maintenance, in terms of channel profiling and removing vegetation that obstructs the flow,
- Poor management of river basins, that is, river flows in terms of knowing the behavior of watercourses and taking measures to prevent the overflow.

During the period from 20th April until 17th May, 2014 cumulative precipitation ranged between 250-400 l/m², and only in period from 14th to 17th May up to 250 l/m². At some measuring stations, the measured amounts of precipitation for mentioned period were 2-3 times higher than the usual average precipitation for that period of the year and the highest ever recorded in the last 120 years.

This hydrological condition caused a dramatic increase in all watercourses in observed area, which caused flooding of 605 residential buildings, 13 commercial and other buildings, traffic interruption on two sections of the main road M18, and the regional road R-455a. The railway line Tuzla - Banovici also suffered major damage. Major damage, partial and complete destruction of all local roads in the area of Zivinice, complete destruction of 7 pedestrian bridges and more severe damage to one traffic bridge. Two residential buildings were completely destroyed, and 974 buildings suffered minor or major damage. During the floods, about 350 people left their homes. The basic features and lessons learned from this flood are given in Table 1.

For one of the proposed solutions to reduce flood risks in the area of Zivinice, the problem is „territorial border“, despite the EU Directive norm implemented through the FBiH and RS Water Law, that is, mutual cooperation for the common good. In 1996, Institute for Water Management developed the conceptual solution for the „Osmaci“ reservoir as a solution to the problem of surface flooding in Spreca river valley. The reservoir would be located near Osmaci settlement (Kalesija). Up to date, nothing has been done because of the „territorial border“,

that is, the dam of the reservoir would be on the territory of the FBiH, and the reservoir itself would be on the territory of the RS.

In conditions of decentralized prioritization, it is difficult to expect good results. The financing methods and the ratio of investments in preventive measures in relation to investments in remediating the consequences are far from reasonable and well-founded. The problem is also insufficient supervision and analysis of the situation in planning and implementation of preventive measures, as well as the disconnection of inspection supervision with the institutions responsible for the field of water management.

3.2. Flood risk management in the Republic of Croatia

In accordance with the Water Law (Official Gazette, No. 66/19 and 84/21), flood protection in RH is managed by Croatian Waters. The operational management of flood risks and the immediate implementation of flood defense measures are regulated by the National Flood Defence Plan (Official Gazette, No. 84/10) and Main Implementation Flood Protection Plan (Croatian Waters, July 2011). Croatian Waters also prepare planning documents for flood protection, which is foreseen by the Water Law. The River Basin Management Plan enables a systematic approach to the development of flood defense and flooding risk reduction for the territory of the RH.

The National Flood Defense Plan plans all the necessary preparatory work and immediate activities in the event of a flood, for the entire area of Croatia. In addition to the detailed organizational elaboration of activities and activity holders for individual areas, it also elaborates prevention measures, early warning, planning, study work and monitoring of water regimes.

According to the provisions of the National Flood Defense Plan, a central operational unit for the management of regular and extraordinary flood defense at the level of the RH, called the Main Flood Defense Center, has been established within Croatian Waters (Proceedings of the Workshop on Flood Risk Management measures & links to EU WFD, Zagreb Croatia, 2015). Main Implementation Flood Protection Plan describes the flood defense operational plans for the entire territory of the RH in detail according to the territorial principle, as well as according to the principle of the management hierarchy.

The Water Management Strategy (Official Gazette, No. 91/08) established a strategic goal of protection against the harmful effects of water, which foresees reaching the functionality of the flood protection system to a level of about 87% by the end of 2023 and up to 100% by the end of 2038. The goal will be achieved through the gradual implementation of works on facilities rehabilitation and reconstruction, and development projects realization. Half of the planned works will be completed in the period until 2023, and the other half in the period until 2038.

Institutions responsible for water management, as well as flood risks, are the Ministry of Environmental Protection and Energy and, as a legal entity, Croatian Water. The RH has two river basin districts: the Adriatic river basin and Danube river basin.

3.2.1. Municipality of Gunja (RH) in the floods of 2014

Gunja is located in the Vukovar-Srijem County in its southern part, on an area of approximately 31 km². According to the 2011 census, 3,732 inhabitants lived in the municipality territory. Significant road corridors pass through the territory of the municipality. The land altitude in the Vukovar-Srijem County ranges from 78 m to 204 m, which makes it an extremely low plain area. Along the border with Bosnia and Herzegovina, Sava river flows in a length of 15 km. In addition to the Sava, the Bosut River is also important in the „BiDj-

Bosutsko polje“, with the largest tributary being the BiDj River. Watercourses that cross the municipality are Cupinica, Pakaca and Zalogito.

Achieved level of flood protection in the BiDj - Bosut field is high, due to construction of a large number of hydrotechnical facilities. The Sava defense embankment is protected from the overflow of high waters in such a way that the elevation of embankment crown is designed and constructed 100-120 cm above the 100-year high waters. The village of DJurici has the greatest safety from flooding in defended area, while the most threatened places are Strosinci, Gunja, Vrbanja and Spacva, and partially threatened places are Racinovci and Drenovci.

Sava river embankment breached in the night from May 17 to 18, 2014 near Rajevo Selo, while Rajevo Selo, Racinovci, Gunja and several other places were flooded. The embankment broke in a length of 30 m. For the break of the embankment and the flooding in Posavina County, the Republic of Croatia, that is, Croatian Waters, was declared responsible (<https://www.jutarnji.hr>). The basic features and lessons learned from this flood are given in Table 1.

The floods from Gunja pointed to another very important aspect in flood risk management - interstate cooperation and especially good communication and information exchange. The poor cooperation between two neighboring countries (BiH and RH), which is defined by the Framework Agreement on the Sava River Basin (Article 13, Point 1), is illustrated by a statement from this period: "... The flood in Cvelferija was caused by the exceptionally high water levels of the Una, Vrbas and Bosnia, while we had no information from Bosnia and Herzegovina about the amount of water coming to us in Croatia," stated the General Director of Croatian Waters (<https://balkans.aljazeera.net/teme/2019/5/19/pet-godina-nakon-poplava-gunja-raseljena-i-zaboravljena>).

2. OVERVIEW OF PROTECTION AND RESCUE SYSTEM BASIC CHARACTERISTICS AND FLOOD RISK MANAGEMENT

A comparative analysis of significant aspects in flood risk management in two countries (BiH and RH) with reference to the analyzed local communities is given in Table 1.

Table 1: Comparative analysis of significant factors for protection and rescue and flood risk management in BiH and HR (*adapted, sources:*

https://www.unisdr.org/files/9346_Europe.pdf, www.preventionweb.net/countries/bih/data/)

FLOODS / FLASH FLOODS		
IMPORTANT FACTORS	BiH	RH
ADINISTRATION AND COMPETENT AUTHORITY	- Ministry of Security of BiH (Level 1) in matters including strategic planning, coordination and international cooperation - FBiH and RS is Level 1 administration - BD, cantons of the FBiH and regions of RS are Level 2 - Municipalities are Level 3 administrations	- Civil Protection - legal responsibility of the Government state – Level 1 - 20 counties, plus city of Zagreb, the capital – administrative units Level 2 - Towns and municipalities - Level 3
FINANCING (AVERAGE ANNUAL FOR CIVIL PROTECTION)	- Total funding Level 1: approx. 1.3 mil EUR - Level 2 & 3: approx. 7 mil. EUR	- Level 1: 8.3 mil. EUR - Level 2 & 3: 41.7 mil. EUR Note: incomplete info

FLOODS / FLASH FLOODS			
IMPORTANT FACTORS		BiH	RH
HUMAN RESOURCES DURING „EMERGENCY PERIODS“		- Level 1: 20-40 people - Level 2 & 3: 590 people	- Level 1: 540 (national) + 950 (private special. cntractors) + 50 (prof. fire fighters) - Level 2: 180 / Level 3: 2,300 (prof. fire fighters) + 60,000 (volunteers)
AVRG. ANNUAL FLOOD LOSS		54,71 mil. \$	147,78 mil. \$
FLOOD RISK FREQUENCY		52%	41%
LEVEL DEALING WITH EVENT		Level 1	Level 1
DEGREE OF IMPACT		High	High
PREPAREDNESS	PREDICTION SYSTEM	Working at Level 1	Working at Level 1
	VULNERABILITY MAPS	Existing at Level 1	Existing
ALERTS/ WARNINGS	PROCEDURES	Level 1	Working at Level 1
	EFFICIENCY	Upper medium	Low
	PUBLIC PERCEPTION	Upper medium	Low
RESPONSE/ SEARCH / RESCUE	PROCEDURES	Level 1	Working at Level 1&2
	EFFICIENCY	Low	No data
	PUBLIC PERCEPTION	Low	No data
FLOODS 2014	BASIC FEATURES	Zivinice (BiH): - Material damages: about 10 million EUR/ State of natural disaster: 14.05 - 15.12.2014. - 2 residential buildings completely destroyed, 974 buildings suffered minor or major damage - Evacuated: 350 people	Gunja (RH): - Material damages: 50 million EUR/ 18.5. 2014. the whole municipality was flooded and all the houses / State of emergency: 16.05 - 04.06.2014. - Complete evacuation
	LESSONS LEARNED	- No essential changes have been made in protection and rescue system - After analyzes and recommendations given, little has been achieved - There is still a lack of flood containment units and water and under water protection units	- Adopted special so-called "Law on Gunja" / acquired equipment for CP operational forces / continuous training - Restructuring: in 2019, the CP Directorate was established in the Ministry of Internal Affairs of the RH - the central body of state administration responsible for civil protection affairs

The protection and rescue system in the RH is in many aspects more functional and organized than the existing one in BiH, although there are some shortcomings that need to be corrected. From the aspect of protection and rescue in the domain of personal prevention and protection, the basic remark can refer to the necessary greater involvement of the population in reducing the risk of disasters.

During every disaster, it is necessary to keep records - a log of activities that includes information about what was done and the way the disaster was managed. This information would provide insight for subsequent analyzes of the lessons learned and answers to the questions: what turned out to be good, what needs to be refined, and what needs to be changed urgently? At some BiH institutions that did such analyses, the implementation of proposed measures to improve protection was started, but they were not fully completed. On the other hand, RH has a special register of flood events that can be used as good guideline for flood risk management.

3. CONCLUSION

In BiH, protection and rescue system functioning, as well as the flood risk management, is limited by constitutional and legal provisions, and in addition to that all, bad social, economic and political environment, makes the system as it is today, inadequate.

The flood protection system in BiH is fragmented without clearly defined responsibilities of different levels of government. The lack of a unified methodology in the planning of preventive flood protection measures and without harmonizing priorities in one river basin cannot produce good results. One of the major shortcomings is poor coordination of institutions responsible for preventive measures implementation, and only partial supervision and monitoring of its execution. The floods of 2014 showed that there was no synergy between the bodies that manage water, and thus the flooding risks, and the bodies that deal with the protection and rescue of people and material goods.

On its path and transition, Bosnia and Herzegovina is slow in regulating and harmonizing its legislation with the EU, insufficiently invests in prevention and most of the money is usually spent on remediation of the consequences.

By adopting and incorporating European regulations into Croatian, there are gradual changes and significant improvements in protection and rescue system and flood risk management, which has improved flood defense to a much higher level than in Bosnia and Herzegovina.

Also, the Republic of Croatia has „inherited” unresolved problems (such as illegal construction) from an earlier period, due to which it still suffers major consequences from floods. It is evident that the Republic of Croatia invests much more in civil protection financing at all levels and that it has significant human resources at its disposal (Table 1). Here, the number of volunteers involved in emergency situations is particularly highlighted, for which there is no verified and available data in Bosnia and Herzegovina. Nevertheless, the material damages caused by the catastrophic floods in 2014 in the Republic of Croatia are extremely high.

Unlike Bosnia and Herzegovina, which did not learn significant lessons from difficult experiences or made substantial improvements, the Republic of Croatia, after 2014 floods, adopted special law in order to compensate the entire damage or a portion of it. RH as well established the Directorate of Civil Protection of the Ministry of Internal Affairs with the aim of overcoming anomalies identified by a systematic analysis of civil protection.

It is expected that BiH soon becomes a full member of the EU Mechanism for Civil Protection what could be a good moment to work on system improvement since this should significantly strengthen state capacities and readiness for efficient response to disasters. Another benefit of this membership is the opportunity for protection and rescue institutions to be equipped, trained and qualified according to EU standards as well as to get support from other state members when needed.

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