

**BOSNIA AND HERZEGOVINA NATIONAL
REPORT FOR THE STABILITY PACT**

**DISASTER PREPAREDNESS PREVENTION
INITIATIVE FOR SOUTH-EASTERN EUROPE**

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INTRODUCTION

NATURAL AND GEOGRAPHIC CHARACTERISTICS OF THE TERRITORY OF BOSNIA AND HERZEGOVINA

Bosnia and Herzegovina, as a state, has been administratively divided by the Dayton Peace Agreement into two Entities: (1) the Federation of BiH which includes 51 % of the territory and (2) the Republika Srpska which includes 49 % of the territory.

Bosnia and Herzegovina (BiH) is located in the western part of the Balkans Peninsula. It has a common border with Croatia in the north, west and south, and with the Federal Republic of Yugoslavia in the east. The territory of Bosnia and Herzegovina covers 51,129 km² where, according to the 1991 Census, 4,354,911 inhabitants lived.

The dominant areas in Bosnia and Herzegovina are beyond 200 m altitude, which is the territory covering 44,450 km² or 87 %. The average altitude is about 525 m with some mountains beyond 2,000 m.

The territory until 500 m altitude covers 20,930 km² or 41 % of the territory, the territory from 500 – 1,000 m altitude covers 17,400 km² or 34 %, which makes up 75 % of the territory of Bosnia and Herzegovina at the altitude until 1,000 m.

The territory above 1,000 m altitude covers 12,900 km² or 25 % of the territory of Bosnia and Herzegovina.

The areas until 500 m altitude are mostly located in the northern and southern part of BiH and the valleys of the rivers: Una, Sava, Vrbas, Bosna, Drina, Spreča and Neretva.

As for the ground inclination in Bosnia and Herzegovina, only 8,111 km² or 15,8 % of the territory is of lesser inclination than 13 %, whereas 84,2 % of the territory has more than 13 % inclination. Therefore, it is impossible to use machinery in the field of agricultural production.

The portion of the forestland in these areas is a bit bigger than the agricultural one, but it should be stressed that a large part of the forestland is covered by destroyed and thin forests as well as under-wood. A distinct relief, with sharp and steep slopes, geologic structure, plant cover of the terrain and the way of use, together with the precipitation regime, determine the hydrology of water flows in the middle and upper basins.

The territory of Bosnia and Herzegovina is characterized by a complex geological structure and tectonic system. As for the climate, Bosnia and Herzegovina may be separated into three separate wholes: Herzegovina with a modified or Mediterranean climate; Central Bosnia with continental-mountainous or Alpine climate; and Northern BiH – parts of the Pannonia Plain with moderate continental, or mid-European climate.

Topographic, geologic, climate and other conditions and circumstances created a diverse hydrologic picture of Bosnia and Herzegovina. The hydrologic situation of the territory of Bosnia and Herzegovina is not uniform and there are huge differences in the density of river network, number of springs, lakes and other hydrologic objects with two river basins toward

which all BiH rivers gravitate. Water from the territory of Bosnia and Herzegovina flows into two directions – basins: the Black Sea about 74% and the Adriatic about 26% of the territory of Bosnia and Herzegovina.

The territory of Bosnia and Herzegovina is completely located in the Dinara mountain massif, which is characterized by complex and mostly very difficult geomorphologic conditions. The configuration of the terrain is very complex: located in this area are the biggest deposits of coal, salt, ferrous ore, clay, quartz, limestone, gravel and other minerals. It brings about the conflict between two urgent social interests expressed in the need to use natural resources, namely: a) space which is limited; and b) a considerable part of minerals, which are, beside being limited, also exhaustible (Tuzla, Zenica, Mostar, Banja Luka etc.).

While reviewing natural and geographic characteristics of the territory of Bosnia and Herzegovina, we should take into account that it is partly rocky terrain which facilitates the creation and development of land-slides. If we add to that also those complex geo-tectonic and geomorphologic relations, then it is understandable that many ground disturbances take place, which cause big ecological, security and economic problems in many urban areas, and around communications, mines, hydropower plants, water-management and other objects.

1. THE PROFILE OF DISASTERS

According to the Law on the Prevention from Natural Disasters, natural disasters are: earthquakes, floods, snow drifts, avalanches, ice accumulation on big water-flows, landslides, soil settling, droughts, storms, hail, frost, conflagrations, gas expansions, traffic accidents, destruction of dams at accumulations, epidemics, epizootics, contagious diseases, calamities of plant diseases and pests, radioactive and other pollution of air, water, land and food, mining accidents, settling of land due to the exploitation of mines and other minerals, as well as other similar events which may endanger the health and lives of a large number of people and which may cause considerable material harms.

The most dangerous natural disasters and catastrophes which cause harm to material goods and endanger human lives, and which have been registered in the territory of Bosnia and Herzegovina, are related to earthquakes, storms with hail, winds of destructive intensity, and lightning, snow storms, rains of strong intensity and short duration which cause torrential floods, landslides and mudslides, floods, droughts, early and late frost, forest fires.

Apart from these disasters of natural origin, Bosnia and Herzegovina was affected by nuclear power-plant accident at Chernobyl. Due to the proximity of the nuclear power plants Krško in Croatia and numerous nuclear power plants in central Europe, Bosnia and Herzegovina is in a zone of high risk of nuclear accidents. The gravest consequences have been caused by war operations and humanitarian catastrophe during the last decade due to the war in the territory of BiH and former Yugoslavia in general.

It is also known that in BiH, in the technological process of some industrial capacities, some materials are used which, in spite of relatively developed infrastructure, represent danger for the staff and the surroundings. Besides, the complex natural conditions, the existence of dangerous (suffocating, inflammable, and explosive) gas, aggressive inflammable and

explosive dust, the depth of exploitation, danger of underground implosions, fire danger, the possibility of penetration of surface water and danger of underground water, the occurrence of landslides and huge number of staff are the main characteristics of the mining industry.

In addition, a massive use of explosive devices in technological process and the widespread electric distribution network with several power plants, facilities and installations, as well as the use of waste disposal sites with high earthen dams, have impact on increasing the danger for the mines and citizens who live in the vicinity of mines.

The aftermath of the war is a period in which Bosnia and Herzegovina has been more intensively exposed to the risks of disasters and catastrophes. The main reasons for that are the following: the stayed process of planning, outdated and obsolete plans, destroyed and not-reconstructed system of infrastructure, particularly meteorological, hydrological and seismological systems for observation and communication, which have damaged the efficiency of technical-technological systems of early warning, observing and forecasting natural disasters, thus increasing the risks. Other reasons are the lack of documentation, (high level of damage or destruction) increased susceptibility of physical structures to the risk with regard to their war destruction and destruction of the system for the protection from disasters and catastrophes, the lack of funds, lack of technological equipment of the existing institutions, low level of awareness regarding dangers, low level of expertise of the people employed in different sectors which are related to the protection from disasters and catastrophes...

EARTHQUAKES

General characteristics

Destructive earthquakes which periodically endanger certain parts of the country not only constantly and potentially jeopardise human lives and material goods, but endanger entire human activity and its normal development in those fields.

Since in BiH it is not yet possible to accurately forecast earthquakes appearances, i.e. to predict the time, place and intensity of its appearance, although the methods of seismological locating have tremendously advanced, it is possible with great certainty to ensure the efficient protection from earthquakes and prevent its destructive consequences. The seismological map, within that framework, represents only the last phase of seismological, seismo-tectonic, and other relevant research in our country, but it is not a definite answer to the seismological situation in the BiH territory. Therefore, it is necessary to update and amend it periodically on the basis of new scientific discoveries.

Location/Affected area

The territory of Bosnia and Herzegovina represents one of the most active seismological area of the Balkans Peninsula, which is a part of the Mediterranean-Trans-Asian seismological area.

The earthquake zones in the territory of former Yugoslavia are the Dinarides, Sar-Pind mountain area, Sava, Rodhop and Carpathian-Balkans zones. The most frequent and the

strongest earthquakes occurred in the areas of Dinara Mountain, the lower Neretva River, Boka Kotorska, Dubrovnik, Podrinje, Sumadija, Metohija and Skopje, which have been very destructive.

In the territory of former SFRY, the most frequent and the strongest earthquakes which endangered Bosnia and Herzegovina by their intensity, occurred along the Adriatic Coast, in the vicinity of Dubrovnik, Split, the Sava basin, etc.

According to the available data, Bosnia and Herzegovina – Federation of BiH does not have the areas of the X degree intensity of the Mercalli – Cancani – Sieberg scale (MKS). The areas of the IX degree are located in the area near the west border with the Republic of Croatia, i.e.: From Sinj – Makarska – Hvar Island – Peljesac Peninsula – Mljet Island to Boka Kotorska, Ulcinj – Skadar – Podgorica – Gacko – Mostar as well as in the area of Banja Luka. Other parts of the territory of Bosnia and Herzegovina are characterised mainly by the maximum intensity of earthquakes ranging from VII to VII degrees of the MKS.

There is a possibility of occurrence of destructive earthquakes in the next one hundred years, especially in the areas of Banja Luka, Livno and southeast Herzegovina.

The Banja Luka earthquake zone is seismically one of the most active areas in BiH and beyond. In the past, in this earthquake zone several destructive earthquakes occurred, in the following years: 1884, 1935, 1969 and 1981.

Earthquakes which occurred on 26 and 27 October 1969 had a great seismological impact in the area of Krajina and beyond. In the territory of 9,000 km², in 15 Municipalities: Banja Luka, Čelinac, Laktaši, Prnjavor, Gradiška, Kotor Varoš, Kneževo, Srbac, Ključ, Jajce, Prijedor, Sanski Most, Novi Grad and Dubica, earthquake intensity was 7, 8 and 9 degrees of the MCS scale. The disaster equally affected all fields of public life, and its destructive power destroyed or considerably damaged material goods in economy, housing, health, culture, social protection, public and social services, infrastructure, whereas 1,117 people were injured, and 15 died. Out of the total of destroyed housing stock, 43.2% belongs to the urban areas, while 56.8% belongs to other residential areas. Economic and non-economic objects suffered great damage. Among them, 266 schools, 146 cultural institutions, 133 health institutions, 29 social institutions, 152 public and administrative institutions and a considerable number of object of public importance and economic organizations were damaged or destroyed.

Date	Area	Magnitude of earthquake	Intensity of earthquake in the epicentre
25.12.1908.	Vlasenica	M=5,3	Io=6-7 MCS scale
14.02.1927.	Ljubinje	M=6,0	Io=8 MCS scale
17.12.1940.	Derventa	M=5,1	Io=7 MCS scale
31.12.1950.	Drugovići (Prnjavor)	M=5,7	Io=8 MCS scale
11.06.1962.	Treskavica	M=6,0	Io=8 MCS scale
07.03.1967.	Luke (Srebrenica)	M=5,1	Io=9 MCS scale
27.10.1969.	Banja Luka	M=6,6	Io=9 MCS scale
25.08.1970.	Gacko	M=5,0	Io=

Table 1. Overview of the strongest earthquakes which affected the RS (since 1908.)

Specific preparedness measures:

Due to the accidental character of earthquakes, it is necessary to constantly observe seismological activities of the whole earthquake zone and beyond, through the network of seismological stations. For that purpose, after the catastrophic earthquake in 1969, a modern seismological station for the research of earthquakes in the region was built in Banja Luka.

During the war, the local seismological stations which were operational in a larger area were destroyed. Similarly, the instruments which were installed in the seismological center in Banja Luka cannot be used appropriately anymore due to the lack of maintenance and shortage of spare parts and outdated equipment (30 years).

Assessment tools:

MCS scale

LANDSLIDES AND SOIL SETTLING

Location/Affected area

Bosnia and Herzegovina is characterized by striking diversity of the litho-stratigraphic structure of the terrain, the high degree of tectonic and seismological activity, complex geological features, diverse characteristics of the relief, diverse characteristics of the climate, water-flows of different inclination and considerable influence of human activities to the terrain. Everything aforementioned, to some extent, affects the geological characteristics of the terrain.

Landslides represent particularly important danger for material goods and human lives in Bosnia and Herzegovina. Having in mind the fact that 80% of the territory of BiH falls within the category of highland, mountainous or mountainous-Mediterranean areas, the occurrence of landslides in the mountainous parts of Bosnia and Herzegovina is very frequent. Due to underground streams and underground waters their frequency is increased. The activating of landslides in Bosnia and Herzegovina frequently occurs due to increase of the quantity of underground waters during springtime. However, sometimes it is caused by illegal and unplanned construction. During the year 2000, in the Zenica area seven people were killed due to the activated landslides, and many families were left homeless. In the same year the activating of landslides caused destruction of the road Sarajevo-Pale. In the most parts of Bosnia and Herzegovina landslides have not been researched, but, for instance, only in the Tuzla area there are more then 130 of them. Reconstruction works are very small and sporadic. Preventing activities or activities related to alleviation of potential disasters are very rare. The number of landslides considerably increased during the war and in its aftermath due to uncontrolled exploitation of forests and exploitation of minerals, which affects the change of the water and land regimes, as well as due to increased illegal and unplanned construction.

Soil settling in Bosnia and Herzegovina is most frequently caused by the underground exploitation of minerals. The most endangered area in the FBiH is Tuzla – as the consequence of salt exploitation. Characteristic landslides occur in some mines such as: coal mine Breza –

open-cut mine “Koritnik”, the mine and steel factory “Vares”- open-cut mine “Smreka”, whereas in other open-cut mines, landslides of smaller size occur. Harmful consequences of the soil settling have affected more than ¼ of the Tuzla urban area. Taking into account a long presence and specificity of that problem, special methods of planning have been developed in Tuzla, aiming at the alleviation of the consequences of soil settling.

According to the past research, in the Republika Srpska major instabilities of the terrain with landslides are located in:

- Dubica (DI, Ng)
- Novi Grad (AI, Ng)
- Banja Luka (DI, Ng)
- Prnjavor (DI, Ng)
- Derventa (DI, Ng)
- Doboj (DI, Ng, T, J)
- Lopare (DI, Ng)
- Ugljevik (DI, Ng)
- Sarajevo (DI, Ng, embankment)
- Višegrad (DI, T, J)
- Gacko, Čemerno, Srbinje (Flis) etc..

Factors contributing to vulnerability

Long and heavy rains and floods.

Specific preparedness measures:

The task of geology is to observe, research and forecast the development of modern geological processes, landslides, etc., and in case of their appearance to give appropriate warnings and take appropriate steps for alleviating it.

Monitoring and research of risk from soil settling and landslides, informing the public in order to be able to undertake efficient and organized actions in case of soil settling and landslides. Technically trained and equipped rescue units have to be established.

Assessment tools:

Continuous monitoring.

FIRES

General characteristics:

Fires in Bosnia and Herzegovina so far mainly occurred as a result of industrial or natural disaster (drought). Since no fire protection system has been technologically developed and taking into account the administrative partition of Bosnia and Herzegovina and insufficiently developed hierarchy of the state system, as well as unclear responsibilities and bad coordination of activities between certain administrative units, fires caused by drought and high temperatures during the summer 2000 affected almost all territory of FBiH and caused damage which has later been assessed.

Droughts facilitated the occurrence of forest fires, the duration of fires, and it made difficult the firefighting effort. In order to fight the forest fires affecting several municipalities in the

Federation of Bosnia and Herzegovina and the Republika Srpska, it is necessary to engage a large number of fire fighters and population as well as to use considerable equipment.

No forest management authority in the Republic organizes monitoring of forests with the aim to discover forest fires in time, nor follows the meteorological parameters which facilitate the occurrence of forest fires.

Factors contributing to vulnerability: long droughts, industrial disasters.

Specific preparedness measures:

Monitoring and research the risk of fire, informing the public in order to be able to undertake efficient and organized actions in case of fire. Technically trained and equipped rescue units have to be established (fire departments / brigades).

FLOODS

General characteristics:

Floods result in huge material damage: flooded residential areas, communications, destroyed bridges, killed cattle, with the high risk for human lives. According to the natural conditions in BiH, the plain terrain, river valleys, large Karst valleys are the only suitable regions for settlements, industrial construction and development of economic infrastructure. With increased settlement and scarcity of available space in these regions, their usage and total value is increasing more and more. Accordingly, the danger of floods is increasing as well as the need for flood protection. Due to the soil erosion and torrents multiple damage is caused; destruction of land and loss of land fertility... During droughts water supply for population is affected, and epidemics of contagious diseases which are communicated through water have been registered.

Location/Affected area

The relief of BiH is characterized by relatively steep slopes, which result in unequal draining along with unequal precipitations. Many floods with different consequences have been registered in the 20th century. Briefly we can say that floods along big water streams have so far been the result of the combination of prolonged rains with or without snow thawing. The river Sava and its tributaries frequently flood. Smaller water-streams have a torrent character and their water quantity frequently increases. Particularly critical are mountain streams from lower mountains, which are shaping the Sava river valley, as well as upper course of direct tributaries of the Sava river. Well known are floods in the areas around upper water courses of the Sava tributaries (Unac - Drvar; Jala -Tuzla; Krivaja – Olovo; valleys of Spreča, Usora, Miljacka and Željeznica - Sarajevo etc.), as well as middle and lower course of the Sava tributaries (Una – Bihać, Kulen Vakuf, Bosanska Krupa; Sana - Bos.Novi, Prijedor, Sanski Most; Vrbas - Gornji and Donji Vakuf; Bosna - Zenica, Maglaj, Doboј, Drina – Foča, Goražde, Zvornik, Janja). In the Sava valley, the areas of Bos. Dubica, Bos. Gradiška, Srbac, Bosanski Brod, Derventa (Ukrina), Bos. Šamac, Orašje, Brčko have been frequently affected by floods. Floods in the great Karst valleys are the result of discrepancy of water inflow and outflow through evacuating capacities of seeping of water underground, surface flows and tunnels. In general, the geographic location of Bosnia and Herzegovina is such that the aggregate climate is not dominated by only one type, i.e. there is no separate dry season like

in the tropics. In the last ten years, however, trends of decreasing value of average yearly water-flows have been noticed. These trends have been developed on the basis of Black Sea basin, and particularly the Adriatic basin.

Taking into account the outdated water regime in Bosnia and Herzegovina, about 2,500 km² (about 60% of all plains and lowlands) have been endangered. Before the beginning of the war about 50% of endangered areas have been protected, whereas most of the Karst valleys and river valleys have been left without the protection system. According to the information from the Urban Plan of the Republic of Bosnia and Herzegovina, 450 km of embankment, about 210 km of drainage, about 450 km of partial regulation of water-flows and 23 pumping stations with the capacity of 120 m³/sec, have been constructed.

During the war, most of the systems created for the purpose of flood protection have been damaged.

Generally speaking, according to the total yearly precipitation and outflow (surface and underground waters), Bosnia and Herzegovina belongs to water-rich areas. The climate, geographic and other relevant factors unfavourably affect the hydrological regime in all aspects and in most water-flows, thus classifying it as very unequal, not only in space but in time as well.

Due to unequal precipitation distribution and unfavourable hydrological characteristics, in the past in Bosnia and Herzegovina 2617 km² or 5.12% of the territory were exposed to floods. These precipitations covered the areas where the water spill out from the river bed and floods wide areas of its surroundings, and where the duration of the floods is more important (one day or more) as well as their frequency (once or several times a year).

Ord. No.	WATER-FLOW AND BASIC NETWORK STATIONS	V.V. (m ³ /s) Q 0.01/Q 0.05	M.V. (m ³ /s) Q 0.05
1	2	3	4
1.	UNA (length of the main stream 199,3 km)		
	Martin Brod – downriver »0» = 309,93 m.n.m.	785/617	7,57
	Bihać «0» = 219,83 m.n.m.	-	-
	Kralje «0» = 200,85 m.n.m.	905/720	13,7
	Bos. Novi – downriver..... «0» = 116,00 m.n.m.	1962/1760	30,8
	Bos. Dubica «0» =	-	-
2.	UNAC		
	Drvar..... »0» = 463,32 m.n.m.	213/167	0,100
	Rmanj Manastir »0» = 314,66 m.n.m.	203/181	3,10
3.	SANA (length 146,2 km)		
	Ključ »0» = 246,93 m.n.m.	351/284	3,40
	Sanski Most »0» = 156,18 m.n.m.	771/659	7,32
	Prijedor »0» =	787	6,32
4.	VRBAS (length 240,7 km)		
	Gornji Vakuf »0» = 664,46 m.n.m.		
5.	BOSNA (length 312,1 km)		
	Usora »0» = 140,16 m.n.m.		
	Zenica »0» = 307,60 m.n.m.	1415/1068	12,0
	Raspotočje »0» = 312,61 m.n.m.		
	Dobrinja »0» = 392,02 m.n.m.		
	Reljevo »0» = 478,46 m.n.m.	496/396	2,57
6.	DRINA		

	Foča – Ustikolina »0»		
	Goražde »0»		
7.	SARAJEVO (Miljacka) »0» = 538,93 m.n.m.	251/169	0,440
8.	KRUPAČKE STANE (Željeznica) . . . »0» = 573,70 m.n.m.		
9.	PODSTIJENJE (Fojnica) »0» = 460,74 m.n.m.		
10.	TRAVNIK (Lašva) »0» = 508,54 m.n.m.		
11.	MERDANI (Lašva) »0» =		
12.	OLOVO (Krivaja) »0» = 527,16 m.n.m.		
13.	ZAVIDOVIĆI (Krivaja) »0» = 204,32 m.n.m.	977/693	3,12
14.	KARANOVAC (Spreča) »0» = 150,06 m.n.m.		
15.	NERETVA (length 197,7 only in BiH)		
	Čapljina »0» = 6,32 m.n.m.		
	Žitomislić »0» = 16,25 m.n.m.	2179/1889	29,9
	Mostar »0» = 40,27 m.n.m.	1830/1626	23,4
	Konjic (Hagenuk) »0» = 268,65 m.n.m.	1169/854	7,83
	Glavatičevo »0» = 348,66 m.n.m.		
	Ulog »0» = 640,94 m.n.m.		
16.	Lištica (Lištica) »0» = 278,73 m.n.m.		
17.	Ugrovača (Ugrovača) »0» = 266,27 m.n.m.		
18.	SAVA (length 350 km along the BiH border)		
	Orašje »0» = 76,33 m.n.m.	4527/4060	190

Overview of the water-flow length and the basic network stations in BiH

High waters endanger around 250,000 ha of the land, which is around 4% of the total territory of BiH, or 60% of the plains. However, a much larger territory is exposed to extensive humidity – up to 420,000 ha in the plains and around 300,000 ha in highlands.

The BiH territory is characterized by unequal regime of waters according to time and space. The Sava basin includes about 74% of the BiH territory, whereas the Adriatic basin includes 26% of the territory. The relationship of water outflows is different – 58% toward the river Sava and 42% toward the Adriatic Sea.

During the flood period, from 1976-1980, the average damage in Bosnia and Herzegovina amounted to about 162,600,000 KM a year, which inflicted tremendous damage to the population. Only in the year 1976, 43 municipalities were flooded (out of 109 according to the Census).

During a five-year period (1976-1980) three catastrophic floods occurred in different periods of the year, which means one every second year. Neither were floods which occurred in other years negligible just as the damage caused by them.

Factors contributing to vulnerability:

Long and heavy rains and snow thawing.

Specific preparedness measures:

Monitoring and research of flood risk, informing the public in order to take efficient and organized measures in case of floods. The planning has to be undertaken at both the local and state level.

Assessment tools:

The type, intensity, length, frequency of floods (floods occurring every 5 years, 10-20 years, catastrophic floods which occur once in 50 years).

DROUGHT

General characteristics:

There is no unified definition of drought, because it has different meaning depending on the object to which it is related. Mainly, it can be divided into three groups:

- *Meteorological drought*, when in a big area for certain region and season, a considerably smaller amount of precipitations take place as compared with its normal value.
- *Hydrological drought* means the reduction of water level in water accumulations, rivers, lakes, as well as the reduction of underground water level, which does not affect only industry but also agriculture.
- *Agricultural drought*, occurs when the humidity of land and precipitations are insufficient during the vegetative period for healthy plants to reach the phase of ripening, thus causing damage to plants and their fading.

Every water deficit caused by deviations from the established norms is defined as an element which generates natural disaster.

Location/Affected area:

Drought: in the central (mountainous) parts of the country, in the last 50 years three extremely dry periods were registered. In the northeast and southwest of the country, the drought risk is considerably higher, i.e. in the last 50 years, 7 extremely dry seasons were registered.

SNOW DRIFTS AND AVALANCHES

Location/Affected area

The number of snowy days in a year, with a snowfall of more than 0.1 cm (only registered occurrences), ranges from the smallest number in Herzegovina, in the Neretva valley, only 4, whereas at the mountain peaks of Herzegovina the number is 60. The maximum of 80 days occurs at the mountain peaks of central Bosnia.

The lowest value in the mountainous areas of central Bosnia is about 30 snowy days a year. Less than 20 snowy days a year are values for the region of Banja Luka, Doboj, Ugljevik until the river Sava.

The average maximum value of snow cover in south Herzegovina is 5-10 cm. In the part of Herzegovina which is to the north of Mostar, the highest value of snow on the ground is ranging from 40 cm in the lower parts to above 200 cm on the mountain peaks. The same values are also in the region of central Bosnia, until the plains near the river Sava, where those values fall to the range between 30-40 cm. The similar situation is also in the valleys of the rivers Vrbas, Bosna and Drina.

In big towns of the Federation of Bosnia and Herzegovina, during November 1999 the following values of snowfalls have been registered: Bihać 105 cm, Bugojno 85, Sarajevo 83, Tuzla 65, Livno 64, Zenica 51 and Mostar 37 cm.

There are no strict marginal values which define heavy snow with the consequences for the traffic, power-transmission lines etc. We can surely predict that 50 cm of new snow would cause problems in the traffic functioning. In the Sarajevo Canton, according to the estimation of danger from natural disasters, that limit is 30 cm. The experience shows that 5 cm of new snow in 12 hours (in some countries it is 2 cm per hour) is sufficient for issuing public warnings - declaring natural disasters. In the mountainous areas of the Federation of Bosnia and Herzegovina (Bjelašnica, Igman, Ivan, Karaula, Čvrstica, Podvelež) the snow cover may be from one to 2.5 meters.

Specific preparedness measures:

Monitoring and researching the risk of snow drifts and avalanches, informing the public in order to be able to undertake efficient and organized actions in case of snow drifts and avalanches. Technically trained and equipped rescue units have to be established.

HAIL (ICE)

General characteristics:

Thundering, followed by strong storms, or strong precipitations, with hail or without it, cause problems in the traffic, damage to buildings and agriculture and in the mountainous areas they cause strong torrents, flooding of small rivers and landslides on soft terrain.

These disasters most frequently appear from April to October, and rarely during winter.

Location/Affected area:

The highest number of days with hail, that is 3 days, is in the region starting from Sarajevo, along the Neretva valley until its river-mouth and the vicinity of Trebinje. The rest of central Bosnia has one day a year, whereas narrow plain region along Sava, until Doboje and Tuzla has 2 days a year.

In the territory of Bosnia and Herzegovina, there are 30 to 40 days with thunderstorms, while hail, as a harmful element, occurs 1 to 2 times a year. The average yearly damage caused by hail amounts to 30 million KM and particularly affects the primary agricultural production. Hail also affects other material goods, and damages exceed the anti-hail protection investments by 10 times. The anti-hail protection indirectly reduces destructive storms, and partially increases precipitations. In the recent years, there has been an increased danger of hail due to the increase of the average yearly temperature and sudden temperature amplitudes.

In the past 30 years, there has been an organized service for anti-hail protection in this region, the work of which has not been interrupted even in the period 1991-2000. The anti-hail protection system does not prevent the occurrence of hail but alleviates damage. It means that in exceptional and complex weather situations, when the hail processes are of high intensity, even in spite of the hail protection, the hail occurrence and rain can take place. However, even

then the damage is considerably reduced because the natural process of hail creation is considerably reduced. It is difficult and complicated to assess the efficiency due to the complexity of hail creation in atmosphere and its great changeability in space and time. The assessment is based on data which are processed by appropriate statistical methods.

Republika Srpska

The ultimate objective of the development of anti-hail protection system is the development of the system in the whole territory of the Republika Srpska which would be compatible with the systems in the surrounding regions. Changes in the methodology of work and organization of anti-hail protection in other countries are being followed, and direct cooperation has been established with the Hydro-Meteorological Institute (HMZ) of Serbia and the HMZ of the Republic of Croatia.

Specific preparedness measures:

Monitoring and research of the risk of hail (ice), informing the public in order to be able to undertake efficient and organized actions in case of disasters.

DESTRUCTION OF DAMS AT ACCUMULATIONS

General characteristics:

Destruction of dams can take place:

- During catastrophic earthquakes (in unstable earthquake zones);
- In other cases which are not included in calculations (subsequent soil settling, loss of constructive supporting characteristics of land – in the dam and accumulation zone), etc;
- During war operations...;

Specificity of high dams, as objects of public interest on the security of which human lives and the economy of the whole downriver area depend, necessitates that the construction of these objects have to be done with total security and excluding all risks. The question of security of high dams and accumulations is also gaining on importance due to a psychological factor which is particularly expressed by the population of the downriver areas along high water accumulations.

The inundation wave created by dam destruction gradually increases. The destruction of the whole dam cannot take place at once (whether if it is made of soil, concrete, massive or relatively light, monolithic or made of blocks-segments), but gradually, part by part, so that the total quantity and volume of water which flows through cracks is gradually increasing. It takes some time from the beginning of flooding until it reaches the maximum volume. Usually there is enough time to warn the population who live downriver from the dam.

Similar or even greater consequences may appear if the use and managing of accumulations is not done strictly in accordance with the prescribed plan (the Neretva valley, December 1999). Such cases happen if the prescribed hydrological regime of filling up of an accumulation is not known and there is no proper plan for its emptying. In those cases, the water level in the

accumulation should be able to duly accept waves of high waters without disturbance, i.e. to perform the transformation of water wave.

If the managing (emptying) of the accumulation is not adjusted to the inflow of high waters from the flow used by the accumulation, or if it is not adjusted to the downriver water-flow capacities, it may happen that the excessive water spills over the edge, thus creating inundation wave downriver, which can have even more destructive impact than the one caused by the dam destruction.

Location/Affected area

In the Republika Srpska, the following high dams have been constructed: Bočac, Višegrad, Grančarevo, and so far there were no indications of major incidents, which might lead to great dangers.

However, having in mind that several dams will be constructed at the following rivers: Vrbas, Drina and Trebišnjica, there is a potential danger from the dams.

With regard to the seriousness of the problem, the appropriate regulations are applied:

- technical regulations for designing and construction of dams
- manual for technical monitoring of high dams
- book of regulations on technical standards for seismological monitoring of high dams.

Program of activities

Aiming at the protection of population and material goods, especially downriver parts of high dams and accumulations for which a potential danger exists, it is necessary to consistently apply the following:

“Technical Regulations”, “Instructions” and “Books of Regulations” which define:

- physical observations,
- geodetic observations, and
- seismological observations.

For the accumulation area and the space immediately around the future dams, prior to designing and construction, the following situations and trends which are related to all types of dams should be defined:

- Climate trends
- Hydrological trends
- Seismological trends

Continuous physical, geodetic, seismological, climate, and hydrological observations and measures should be organized.

Permanent analysis and interpretation of results should be performed and it should be compared with the project parameters, all in the aim of timely prevention from possible dam and accumulation incidents.

Two registered cases are related to the damage which occurred at the Hydro-Power Plant Mostar (1995) and Hydro-Power Plant Jajce II (1996).

EXPLOSION OF GASES AND OTHER DANGEROUS MATERIALS

General characteristics:

With regard to the knowledge of physical and chemical characteristics of gases, poisonous and explosive materials, production materials and final products which represent constant danger, which are used in the production process, there are possibilities to partially or completely prevent the danger for human lives and material goods.

The consequences which might take place in case of uncontrolled leaking of gases of poisonous and explosive materials would affect the population, environment and material goods. The amount of caused damage, possible human casualties and the number of injured would depend on many factors (the intensity of damage, number of employees, population density, sturdiness of objects, etc.).

In the process of construction of factories which use different dangerous materials, which in case of disaster may endanger wider areas, pollute water-flows and air, which may lead to endangering the health of people, animals and vegetation. The fact that in many factories no production process takes place, and that installations containing dangerous materials are not regularly maintained, shows that there is a possibility of accidents on the installations. Particularly at risk are those factories which have not been in operation for a long period of time and in which there is a danger of accidents in the case of resuming the production process.

Location/Affected area:

The territorial distribution of the facilities for storage and use of industrial gases in the Republika Srpska is as follows:

hydrogen :

- Chemical corn processing Draksenić
- Thermo-Power Plant Gacko
- Thermo-Power Plant Ugljevik

propane-butane:

- "Krajina-petrol" Banja Luka – bottling plant with the reservoirs of the capacity of 3 x 150 m³
- RJ "VAMIKS-POBJEDA" Modriča- bottling plant with the reservoirs of 60 m³.

acetylene production:

- Company Milojević "Gilje -Gas" Bijeljina

carbon-dioxide production:

- "Tehnogas" Kakmuž

industrial gases storage facilities:

- Company Milojević "Gilje -Gas" Bijeljina
- "Tehnogas" Doboј
- "Tehnogas" Trn - Laktaši

- "Metal-gas" Višegrad
- "Auto-rad" Trebinje
- "Kras" Laktaši

use of propane-butane gas in production:

- "Mira" Prijedor
- "Knežopoljka" Kozarska Dubica
- "Pig Breeding Farm" Nova Topola
- "Svila" Čelinac
- Main pipeline of natural gas Zvornik - Sarajevo
- Development of natural gas network for consumers in Srpsko Sarajevo

ammonium:

- use in the production process in cold-storage plants for storage of food:
- "Levita" Gradiška
- "Vitaminska" Banja Luka
- "Veleprehrana" Banja Luka
- "Bosanka" Doboj
- "Semberka" Bijeljina

chlorine:

- use in the production process:
- "INCEL" Banja Luka
- "CELPAK" Prijedor

From the aforementioned data it can be seen that the territorial distribution of plants or installations which use inflammable gases can be found in the whole territory of Republika Srpska. Accidents on these objects may endanger not only the factory staff that uses inflammable gases but also wider areas and the population of the Republic. There were no accidents in the past on these installations, but there is a risk from the use of these installations which should be taken into account and get prepared for all possible interventions.

Accidents in the chemical industry:

- "CELPAK" Banja Luka
- "INCEL" Banja Luka
- "HEMIJA" Modriča
- RAFINERIJA NAFTE - Srpski Brod
- RAFINERIJA ULJA Modriča
- "DESTILACIJA" Teslić
- "SODA SO" - Lopare
- "GLINICA" Zvornik
- Lead and zinc mine - Srebrenica
- "TERPENTIN" Višegrad

Currently in BiH there is no unified database on dangerous materials, which would be used in cases of accidents involving dangerous materials. Neither fire-brigades nor other units are qualified for interventions involving the handling of dangerous materials in cases of accidents, or for the protection of waters in cases of spilling of some dangerous materials.

Factor contributing to vulnerability:

Expansion of gases as well as uncontrolled spilling of poisonous and explosive materials used in the production process may be caused by fire, traffic accidents, earthquakes and other natural disasters (floods, cracking and destruction of dams or water spill-over at dams and hydro-accumulations, landslides, snow drifts and avalanches). A particular cause may be the so-called human factor, where disasters can occur due to the lack of knowledge or negligence in the production process itself. (the best example is the spill-over of chlorine from the tank in the Chemical Plant in Tuzla in 1980).

Specific preparedness measures:

Monitoring and research of the risk of gas explosion and the explosion of other dangerous materials, informing the public in order to be able to undertake efficient and organized actions in case of disasters. Technically trained and equipped rescue units have to be established.

EPIDEMICS AND EPIZOOTICS (ANIMAL EPIDEMICS)

In Bosnia and Herzegovina in the past there were no catastrophic outbreaks of human or animal epidemics. Certain diseases break out sporadically every year, but such occurrences have not posed significant danger to larger human or animal populations. However, there is a constant danger from introduction of certain carriers of diseases, which can endanger human and animal life and health and/or cause huge material damages to the country.

As we follow the situation, we can state that every year new and more dangerous animal contagious diseases appear, which can pose major threat to human and animal life and health and/or undermine national economy. The essence is that we have to be aware of the existence of such threats and have to be prepared to prevent such potential catastrophes and repair the damage that can possibly be caused by them.

Human Contagious Diseases

Epidemics of various diseases represent sudden appearance of large number of cases of some infectious disease in a period of time in particular area. Certain conditions contribute to the outbreak of an epidemic, such as: poor general hygienic situation (living conditions, nutrition, water supply, disposal of waste materials), unplanned population migrations, and especially natural disasters (floods, earthquakes, emergencies and wartime conditions). In all mentioned situations natural environment is disturbed, which results in pollution of potable water supplies, collapse of the system for disposal of waste materials, deficient nutrition and unhygienic living conditions.

Following institutions have the legal obligation to act on prevention and eradication of contagious diseases: Ministry of Health and Social Care, Public Health Institute, Health Insurance, municipalities and their administrative organs, health and other institutions and companies.

Special measures are undertaken for prevention and eradication of following contagious diseases:

- tuberculosis, rabies, Brill Cincer disease, brucellosis, anthrax, German measles, infantile paralysis, diphtheria, dysentery, **echinok okoza**, gonorrhoea, flu, leprosy,

infective mononucleosis, cholera, plague, legionnaire's disease, leptospirosis, malaria, measles, meningococci meningitis, chickenpox, typhus fever, **return fever**, Q-fever, salmonella, syphilis, streptococci pharynx inflammation, scarlet fever, mange, tetanus, typhoid fever, trichinosis, tularemia, whooping cough, hepatitis, viral hemorrhaging fevers, viral meningitis, bacteria-caused contagious food poisonings, contagious brain inflammations, mumps, yellow fever, boreliosis, klamidiasys, laymaniasys, Acquired Immune Deficiency Syndrome (AIDS).

Several epidemics of contagious diseases occurred in Bosnia and Herzegovina in the past:

- Smallpox epidemic in the large part of former Yugoslavia in 1972.
- In 1989 a total of 103 epidemics were registered, affecting 5,402 people. In the same year, 59,655 people fell ill as a result of the flu epidemic.
- In 1990 there were 70 registered epidemics, affecting a total of 2,422 individuals. In the same year, 36,168 people fell ill as a result of the flu epidemic.
- In the first half of 1991 a total of 25 epidemics were registered, affecting 395 individuals. Flu epidemic in the same year affected 15,043 people. These data are shown in the table below, which also includes the structure of epidemics and contagious diseases.

Ord. No.	Type of Epidemics	Number of Cases of Epidemis	Total Number of Affedted People
1	2	3	4
1.	Viral Hepatitis A	10	79
2.	Contagious food poisoning	11	240
3.	Enterocollitis	2	42
4.	Trichinellosis	1	5
5.	Chicken Pox	1	29
		25	395

Animal Contagious Diseases

Basic dangers lie in:

- outbreak of contagious diseases from the List "A" of the O.I.E. Codex (chancery for contagious diseases in Paris).
- outbreak of contagious diseases from the Lists "B" and "C" of the O.I.E Codex (Lists A, B and C are attached in the annex).
- ingestion of harmful agents with food of animal origin which can lead to mass outbreak of diseases among humans, i.e.:
 - live agents: microorganisms, parasites, molds, ...
 - heavy metals (mercury, lead, cadmium, ...)
 - carbochloride pesticides and other chemicals
 - residues of antibiotics, hormones, anabolics, etc.
 - residues of radio active materials

- animal diseases caused by food contaminated by harmful agents (microorganisms, heavy metals, pesticides, residues of drugs and radio active materials, as well as components of animal origin, such as in the case of “Mad Cow disease”).

Animal contagious diseases registered in Bosnia and Herzegovina are:

- Anthrax
- Rabies
- Brucellosis – Q-fever
- Leukosisenzootica bovum
- Encephalopathia spongiformis bov – Mad Cow disease
- Pestis suum – Swine Plague
- Morbus newcastle – Newcastle disease
- Aphae epizooticae – Foot-and-Mouth disease
- Trichinellosis
- Tuberculosis

Around twenty animal contagious diseases were identified through laboratory examinations of the diagnostic materials in Bosnia and Herzegovina. According to epidemiological estimates, occurrences of epidemics of contagious diseases are ten times more frequent at the time of natural disasters than under normal conditions. Outbreaks and manifestations of contagious diseases are most often result of the following:

- a) weakened control of the import of livestock, meat products and animal feed,
- b) very weak and ineffective supervision by inspection authorities of domestic market, which makes possible transmission of diseases,
- c) unsolved question of financing specialist and diagnostic institutions
- d) intentional introduction of carriers of certain diseases from abroad.

Federation of Bosnia and Herzegovina

Protection measures are preventive and direct operative protection measures aimed at prevention or alleviating of negative impact on animals and food of animal origin. Veterinary service is responsible for the protection of human and animal health, preventive treatment and diagnostics, Atomic, Biological and Chemical (ABC) protection, cleaning up of the affected areas and evacuation and sheltering of the livestock.

Republika Srpska

Veterinary service of the Republika Srpska is organized in the whole territory of this Entity and works regularly on prevention and eradication of contagious diseases (see attached map of the Republika Srpska with municipalities possessing organized veterinary service). In addition, there is one diagnostic laboratory in Banja Luka, and there are plans for establishing two more regional laboratories.

Because of the geographical location of Republika Srpska, there is permanent danger from outbreak and spread of contagious diseases. This has to be kept in mind and continuing training has to be carried out in order to prevent the occurrence of such diseases.

General Measures

1. Providing hygienically proper potable water supplies, as well as sanitary protection of water sources and objects for distribution of water to the public,
2. Disposing waste water and other waste materials in the manner and under conditions that provide protection from contamination by waste water from the ground.
3. Maintaining proper sanitary and technical standards in public buildings, means of public transportation and in public places.
4. Securing proper sanitary condition of animal food and provisions.
5. Performing preventive disinfection and extermination of pests and rodents.
6. Providing sufficient quantities of disinfectants and other required materials.

Special Measures

1. Early identification of the sources of infections and ways of transmission,
2. Laboratory examination of the carriers of contagious diseases and epidemics of contagious diseases,
3. Reporting,
4. Isolation, transport and treatment of infected individuals,
5. Disinfection and extermination of pests and rodents,
6. Health education,
7. Health supervision of employees,
8. Immunization, preventive treatment by serums and medicines,
9. Quarantine, health supervision, and other measures as provided by law.

In the case of large epidemics and accidents (floods, earthquakes, fires), which can lead to the outbreak of epidemics, competent municipal authorities must mobilize health workers and other citizens, and organize requisition of necessary equipment, medicines, means of transportation and working space.

Non-governmental institutions which participate in such cases are Red Cross and civil defense units.

2. NATIONAL POLICIES, PLANS AND PROJECTS

NATIONAL POLICY OF ACTING IN THE CASE OF CATASTROPHES

At the state level in Bosnia and Herzegovina there is no established and unified policy of action in the case of catastrophes, neither there are unified institutions charged with acting in such events. At present, plans and projects of civil defense systems are drawn up at the Entity level.

Basic aims of civil defense systems are:

- Prevention
- Readiness (for action in the case of catastrophes)
- Alleviation of suffering (reducing the negative impact of catastrophes)
- Aid and rescue
- Provision of basic necessities for living
- Recovery and revitalization

Plans for civil defense and rescue are made on the level of competent Entity authorities, local communities, commercial companies, and other organizations.

Federation of Bosnia and Herzegovina

In the Federation of Bosnia and Herzegovina there is no adopted project for reducing the negative impact of catastrophes, but in the municipalities in which partially organized civil defense structures exist there are plans for civil defense and rescue from the impact of natural disasters, in accordance with provisions of the Law on Natural Disasters. At the Federal level, legal and executive regulations concerning activities in the case of catastrophes are being prepared at present.

Republika Srpska

In the Republika Srpska there is set policy of action in the case of catastrophes in addition to plans and procedures of action in the case of catastrophes. The Government of the Republika Srpska passed the directives and formed a Coordination Team and is in the process of preparing bylaws that will regulate this area.

There are already established institutions and systems whose activities fall within the scope of certain areas of prevention and readiness in the case of catastrophes:

- Republic Civil Defense Department
- Hydro-meteorological and Seismological Institute
- Observation and Information Department
- Hail protection firm
- Water resource companies charged with undertaking anti-flooding measures
- Professional and territorial fire brigades and territorial voluntary fire companies
- Republika Srpska Red Cross
- Veterinary service

LEGISLATION

Program for minimizing the danger from atmospheric, hydrologic and seismological catastrophes was drawn up in Bosnia and Herzegovina during 1998-1999 in accordance with corresponding program and recommendations of the World Meteorology Organization and the Program of UN International Decade for reducing the impact of natural disasters. However, due to the lack of funding, the realization of this program has not yet started.

Federation of Bosnia and Herzegovina

In the Federation of Bosnia and Herzegovina, besides already existing Law on Defense (“Official Gazette of F BiH”, No. 15/96) which regulates the field of Civil Defense, the Government of the Federation of Bosnia and Herzegovina prepared and passed the Regulation on Organization, Content, and Carrying out of Measures for Protection and Rescue of People and Material Goods (“Official Gazette of F BiH”, No. 27/98). Besides, the Federation of Bosnia and Herzegovina applies the Law on Protection from Natural Disasters (“Official Gazette of SR BiH”, No. 40/90), and Law on Water Resources (“Official Gazette of F BiH”, No. 18/98).

Republika Srpska

The Republika Srpska passed a number of laws and regulations, which regulate these problems, some of the most important are:

- Law on Civil Defense
- Law on Defense
- Law on Protection from Natural Disasters
- Law on Fire Protection
- Law on Meteorological and Hydrologic Protection
- Law on Seismologic Service
- Law on Water Resources
- Law on Agricultural Land
- Forestry Law
- Law on Legal Status and Powers of the Red Cross of the Republika Srpska
- Regulation on Functioning of the Observation and Information Service
- Regulation of the Network of Weather and Hydrologic Bureaus
- Regulation on Hail Protection

EDUCATION AND TRAINING

Federation of Bosnia and Herzegovina

In municipalities in the Federation of Bosnia and Herzegovina education and training against catastrophes are carried out. Besides organized structures of Civil Defense, other non-governmental organizations took part in the organization of trainings, and there were also cases where SFOR units carried out certain kinds of training.

Following legislation is being prepared at present:

- Law on Civil Defense of the Federation of Bosnia and Herzegovina, which will regulate the area of education and training of the organized structures of Civil Defense and of population at large.
- Special plan and program of education and training, which will be based on the new Law on Civil Defense

Until now the education and training has been carried out in accordance with earlier legislation, which was not unified in the whole territory of the Federation of Bosnia and Herzegovina.

Republika Srpska

Training in following areas has been carried out until the present:

- Training concerning minefields and unexploded ordnance (UXO). This training has been conducted through Office for Quick Mine Clearance in two ways:
 - Training and equipping of mine action teams for clearing minefields and unexploded ordnance,
 - Training of following target social groups: school children and professors, employees and different citizen associations (anglers, divers, mountaineers, speleologists, etc.)
- Training of Red Cross members is in its first phase. At present, the training for instructors has been completed in accordance with programs of the International Federation of Red Cross/Red Crescent. The commencement of the second phase is expected soon.
- Training in fire protection has been conducted in one case, with the international assistance provided by "Florian" organization from England. There is also normal and permanent training of firemen in accordance with education programs (in the year 2000, some 12 exams for professional firemen were held).

All organizations, institutions and services, which are professionally engaged in this field, are conducting training and other activities in the course of their regular activities.

A number of recommendations, projects and programs for equipping and training of some branches of the system for prevention and readiness in the case of catastrophes have been prepared. Some of these programs are:

- already realized:
 - program for training Red Cross instructors,
 - main operative plan for flood defense
 - training of firemen, etc.
- currently underway:
 - mine clearance,
- awaiting funding and requisition of necessary equipment:
 - reconstruction and revitalization of the public warning system and equipment,
 - truncated radio network,
 - development of hail defenses,
 - seismologic monitoring,
 - observation and information system, watching the movement of flood waves in the region,
 - several programs in weather forecasting.

Most of these projects have wider significance (for the whole territory of Bosnia and Herzegovina and the region).

INFORMING THE PUBLIC AND THE AWARENESS OF THE POSSIBILITY OF CATASTROPHES

Public awareness of potential dangers is relatively high. The education and instruction of population on the actions to be taken in particular cases of danger is done through the means of mass media and work in the field. Also, there is awareness (among the public and authorities as well) about the necessity of constructing and equipping some parts of the system for prevention and readiness in the case of catastrophes, but the practical realization of such projects is limited by insufficient material and financial means.

MONITORING, INFORMING AND PUBLIC INFORMING AND WARNING SYSTEM

Public Warning System

Timely warning of population in the case of danger is accomplished through the means of mass media and the public warning system by the Center for Information. Warning equipment consists of sirens (mainly electric, small number of pneumatic ones and very few electronic sirens). Only in bigger cities sirens are controlled remotely by the Center for Information, while in smaller places sirens are activated on the spot. Functional checkup of warning sirens is conducted by the centers for information once a month by sounding “end of danger” signal. Hearing range of the warning signals is insufficient. Downtown areas of bigger cities have relatively good siren coverage, while peripheral areas, smaller cities and inhabited areas are not properly covered by the warning sirens. Many of existing systems were damaged during the war, are otherwise obsolete and have many technical deficiencies, such as: self-activation, big consumption of electricity, and nonexistence of emergency power sources. Due to insufficient funding during war and post-war period, these systems were not maintained and serviced in satisfactory manner. Because of this it is necessary to urgently find ways and funds for installing new and modern warning systems.

Federation of Bosnia and Herzegovina

System for observation and information in the Federation of Bosnia and Herzegovina (system for warning citizens and other legal entities) is organized as an integral part of the Federal Ministry of Defense in its headquarters and cantonal and municipal branches and departments. Its duties in future (following changes and amendments of the Law on Defense) will become part of the Federal Civil Defense Directorate, cantonal civil defense directorates, and civil defense branches in municipalities. Such organization will create right conditions for competent civil defense authorities, enabling timely warning of population about the advent of natural disasters through departments of the Ministry of Information.

Republika Srpska

In the Republika Srpska there are several systems which are by nature of their business in charge of monitoring and warning in the case of danger. In particular those are:

- Hydro-Meteorological and Seismological Institute
- Hail defense
- Observation and Information Department
- System for flood defense
- Veterinary Service

3. GOVERNMENTAL ORGANIZATIONS

At the state level in Bosnia and Herzegovina there is no central competent authority for management in the case of catastrophes.

Federation of Bosnia and Herzegovina

At the level of the Federation of Bosnia and Herzegovina there is the Federal Civil Defense Directorate which is in charge of preparing and undertaking measures for protection and rescue in the case of natural disasters. In case of emergencies, the Federal Civil Defense Headquarters would be established and tasked with managing defense and rescue operations.

Regulations on Organization and Activities of the Federal Civil Defense Directorate provide for 102 staff, distributed across six departments.

The Federal Civil Defense Headquarters is staffed with 11 employees of the Federal Civil Defense Directorate who are professionally engaged in the field of civil defense and 11 members delegated from different ministries.

At the cantonal level there are independent civil defense directorates, in addition to civil defense headquarters organized in accordance with the Federal Civil Defense Directorate's structure, which are in the process of formation.

At the municipal level there are organized civil defense branches and civil defense headquarters.

Republika Srpska

Management in the case of catastrophes is organized at Entity, regional, city and municipal levels. The Government of the Republika Srpska is main organizer of activities on all levels, while the following authorities are charged with direct management of civil defense operations:

1. Civil Defense Directorate on:
 - Entity level, and
 - regional level.
2. Majors and heads of municipalities at city and municipal level.

According to the provisions of the Law on Civil Defense:

1. The Government of the Republika Srpska is charged with:
 - organizing unified and complete civil defense system
 - passing legislation regarding organization, preparation and operations of civil defense
 - supervising and directing preparations of civil defense operations
 - inspecting and directing the work of the Republic Civil Defense Directorate
2. Ministries and special organizations are charged with:
 - organization, planning and securing the undertaking of preventive defense measures and recommending measures and activities for their improvement,
 - performing expert tasks for engaging firms and other legal entities in operations of rescue and protection of population and material goods,
 - providing data significant for carrying out rescue and protection operations.
3. Civil Defense Directorate is charged with:
 - executing adopted policy, laws and other regulations in the field of civil defense,
 - keeping records, organizing recruitment and carrying out mobilization of civil defense members,
 - directing operations of protection and rescue of population and material goods in case of war, state of imminent war danger, natural and other disasters.
4. Major (or head of municipality), in direct cooperation with the Republic Civil Defense Directorate in his area of responsibility is charged with:
 - preparing danger estimates and estimate of needs and possibilities of protection of population and material goods,
 - making considerations of the situation and preparing deployment plans, executing organization, equipping and training, and securing funding,
 - ordering engagement of firms, organizations and services,
 - ordering evacuation.

FUNDING

Federation of Bosnia and Herzegovina

The Government of the Federation of Bosnia and Herzegovina finances operations of the Federal Civil Defense Directorate and the Federal Civil Defense Headquarters and their operative programs in their entirety.

Cantonal governments finance civil defense directorates and headquarters in the same manner.

Municipal civil defense branches and headquarters are financed from municipal budgets.

Besides this, the international community finances mine action teams for mine clearance that are formed in the Federation of Bosnia and Herzegovina.

Funding for emergency operations at all levels, as well as the funds for aid programs, are provided for in the federal, cantonal and municipal budgets, mainly in budget reserves.

Republika Srpska

Financing of the Republic Civil Defense Directorate comes from the Government of the Republika Srpska budget. Majors and heads of municipalities are financed from city and municipal budgets.

Financing of emergency operations and aid programs in catastrophes mainly comes from donations by the international community and solidarity funds.

Action measures in case of catastrophes and disasters are included in urban plans which are based on integration methods of harmonization of development plans in all areas. Because of this, planning for disaster management is done through cross-sector coordination and harmonization of defense plans.

4. NON-GOVERNMENTAL STRUCTURES

Federation of Bosnia and Herzegovina

In the Federation of Bosnia and Herzegovina the following organizations exist and operate: Red Cross/Red Crescent, Caritas, diving associations, mountain rescue service, scouts, nature conservation clubs, and other social organizations which are established in accordance with provisions of the Law on Citizens' Associations.

Republika Srpska

In the Republika Srpska there are several non-governmental organizations and associations which participate in monitoring, providing communications, undertaking preventive measures, preventing, reducing or elimination of the negative impact of catastrophes, educating population and so on:

- The Republika Srpska Red Cross is a non-governmental organization which has adopted principles of the International Red Cross and carries out its activities in accordance with the law, the statute and other legal provisions which regulate this field of activity. It cooperates with all governmental and non-governmental organizations included in responding to catastrophes and is accordingly developing its own operational, management, cooperation and coordination structures.
- Amateur Radio Association is a non-governmental organization which participates in providing communication systems for all structures taking part in the prevention of catastrophes.
- Aeronautical Association through aero and parachuting clubs provides transport and fast introduction of personnel and emergency equipment to the disaster spot.
- Firefighting Association is the association of professional and voluntary fire companies which are active in prevention, training and elimination of the danger from fires.

5. MATERIAL AND HUMAN RESOURCES

At the level of state of Bosnia and Herzegovina the problems regulating deployment of Entity armies and other services in the territory of another Entity are still not resolved.

Federation of Bosnia and Herzegovina

In the civil defense structure there are organized forces and means for protection and rescue, but at present their level of qualification and equipment are insufficient. Hence in the case of catastrophes we would be forced to rely on mobilization of means and equipment in possession of firms and other legal entities, which would then beside their usual activities be engaged in rescue and protection efforts.

Besides these forces, the answers to given questions would have to be provided by: Ministry of Traffic and Communications, Ministry for Social Affairs, Refugees and Displaced Persons, Ministry of Trade and Directorate for Commodity Reserves in Federation of Bosnia and Herzegovina and in cantons, healthcare institutions (hospitals, clinics, etc.), research institutes, Hydro-Meteorological Institute, Public Health Institute, related educational institutions (faculties and schools).

Use of the Army of the Federation of Bosnia and Herzegovina in the case of natural disasters and other kinds of accidents is regulated in Articles 3 and 58 of the Law on Defense of Federation of Bosnia and Herzegovina. In cases when civil defense units and other civil forces are unable to remove the danger threatening population and property, the deployment of army units could be ordered in accordance with provisions of the Law on Defense and operational procedures. Hence during the year 2000, army provided assistance in putting out forest and bush fires at the territory of the Federation of Bosnia and Herzegovina.

The Army of the Federation of Bosnia and Herzegovina possesses significant material resources. Five Federal Army helicopters could be utilized for rescue operations and firefighting. The Government of the Federation of Bosnia and Herzegovina passed the Decision No. 5/2001 on 9th January 2001, which provides 539,650.00 KM for acquisition of five sets of fire dousing rubber water containers for helicopters, and other firefighting equipment for equipping 300 Federal Army soldiers.

Federal Army units own certain firefighting equipment and water tank trucks. They also possess considerable number of vehicles, communication equipment, portable diesel generators, storage facilities, construction machinery and so on.

Centers for Information in most cantons and some municipalities have short-wave transceivers, which have certain advantages over other communication equipment and hence can play extremely important role in the case of catastrophes.

The Federal Army has huge human resources at its disposal, i.e. soldiers, which can be mobilized in the case of catastrophes. The Federal Army Medical Corps possesses valuable experience, which will be of great benefit for the preparation of plans for deployment and operative procedures of the Federal Army units in all kinds of disasters, and the participation of army units in post-disaster rehabilitation effort.

The Federal Army has specialized units and soldiers trained for firefighting, engineering tasks (terrain clearing and mine removal), evacuation, transport, radiological, biological and chemical defense, and decontamination.

When civil defense units, and other civil structures are unable to cope with the emergency situation, the Federal Minister of Defense, acting on request from the Commander of the Federal Civil Defense Headquarters, orders deployment of the Federal Army forces in operations of rescue and protection.

Republika Srpska

Human Resources

Same as material resources, human resources are mobilized in accordance with criteria for mobilization of citizens for defense and rescue and protection purposes.

Human resources can be divided into three broad categories:

- Individuals who are professionally engaged in the field of prevention and readiness (personnel of the Republic Civil Defense Directorate, MAK, Hydro-Meteorological Institute, Seismological Institute, Observation and Information Service, hail defense, fire brigades, water resources companies, veterinary service and healthcare).
- Individuals who are engaged on a voluntary basis in the field of prevention and readiness (Red Cross members, volunteer fire companies, radio amateurs, divers, and so on).
- Individuals who are mobilized in the case of catastrophes from healthcare services, construction companies, communal services, transport firms, etc. The Republika Srpska police and army personnel also fall into this category in the case of catastrophes.

Material Resources

In the Republika Srpska there is large number of rail and road transport companies, whose resources could be mobilized in the case of catastrophes. Besides, there is also Sava river which is navigable almost in its entire course which runs along the border of the Republika Srpska. On Sava river there are two river ports, in Samac and Brčko, and it is possible to build another port in Gradiska. Air traffic facilities exist in Banja Luka, whose airport is capable of handling all types of cargo aircraft, and is situated only 20 km away from the Sava river and Zagreb-Belgrade international highway. In the whole territory of the Republika Srpska there are also significant storage facilities.

SOURCES OF FUNDING FOR EMERGENCY OPERATIONS AND AID PROGRAMS

Federation of Bosnia and Herzegovina

Funding for emergency operations at all levels, as well as the funds for aid programs, are provided for in the federal, cantonal and municipal budgets, mainly in budget reserves.

Republika Srpska

Material resources are provided in accordance with the development and mobilization plans and can conditionally be divided into two broad categories:

- a. machinery and equipment which used solely for the prevention and readiness purposes and is in everyday use in following institutions:

- Republic Civil Defense Directorate,
- Hydro-Meteorological and Seismological Institute,
- Observation and Information Service,
- fire brigades,
- water resources companies
- Red Cross

b. machinery and equipment used regularly by various companies, organizations and services which could be mobilized and deployed for the prevention and readiness purposes. They can be found in following organizations:

- construction companies,
- healthcare and veterinary service,
- transport companies,
- communal services, and so on.

Funding of organizations, training and equipping process and operations by human and material resources is accomplished from:

- budget,
- Republic, city and municipal funds,
- funds accumulated through renting of public shelters and providing of different kinds of services,
- portion of the public revenue funds, such as cadastre fees, vehicle registration fees, taxes, insurance fees, and so on.

6. ASSISTANCE PROVIDED BY THE INTERNATIONAL AND NATIONAL ORGANIZATIONS

INTERNATIONAL NON-GOVERNMENTAL AID ORGANIZATIONS

During the war and in the post-war period in Bosnia and Herzegovina, many international organizations have been engaged in the organization of life in emergency situations and the post-war rehabilitation and reconstruction of Bosnia and Herzegovina.

In 1997 there were 1,700 registered humanitarian organizations, more than 50% of which were international organizations. Most important organizations engaged in physical reconstruction and rehabilitation are: World Bank, European Commission (ECHO), International Management Group, UN and its agencies (UNHCR, UNESCO, UNDP, etc.), EU, International Federation of Red Cross and Red Crescent Societies, World Health Organization, World Monuments Watch, Ircica, etc. Some aid organizations are national in character, such as: USAID, SIDA, ODA, Norwegian People Aid, GTZ, etc.

Generally speaking, contribution of international organizations to physical reconstruction of the country is indispensable.

Education of members of government and non-government organizations and institutions through a number of seminars, meetings and lectures significantly contributed to improving the prevention and readiness capabilities. This kind of cooperation should be continued in

future, and it would be advisable for our side to propose areas and topics for exchange of experiences. Of special interest for us would be the experiences of European countries with comparably complex political systems and experiencing comparable potential dangers.

COOPERATION WITH NEIGHBORING COUNTRIES

There are no programs of cooperation and harmonized operational procedures in the case of catastrophes, adopted in collaboration with neighboring countries. Certain initiatives and initial stages of cooperation are registered in the following areas:

- monitoring and exchange of information among the Observation and Information Services,
- exchange of information among the Hydro-meteorological and Seismological Institutes,
- exchange of information and experiences pertaining to hail defense,
- flood defenses in border areas,
- cooperation of Red Cross Societies

On the basis of the Agreement on Special Ties between the Federation of Bosnia and Herzegovina and Republic of Croatia, the Annex on cooperation in protection from natural and civilization catastrophes was signed and adopted.

Cooperation with neighboring countries can be improved only through legislation of appropriate legal provisions, common planning of protection and rescue measures, closer mutual cooperation of participants in protection and rescue operations, and provision of necessary technical equipment and protection and rescue gear.

COUNTRY'S EXPERIENCES WITH RECEIVING INTERNATIONAL AID

It can be said that besides positive, there were also some negative experiences in relation to the acceptance of international humanitarian aid. Distribution of such aid was not organized in a unified manner. Rather, all humanitarian and other organizations supplied and distributed aid in their own organization, thus creating a state of anarchy in the field. Certain international organizations acted in a non-transparent manner and totally independent of all existing plans, rules and procedures in Bosnia and Herzegovina, the result being wastage of huge sums for reconstruction, low quality of construction work, which created potential danger for collapse of some objects, unsanitary living conditions, destruction of environment and so on.

Besides this, on the territory of the Federation of Bosnia and Herzegovina, many departing international organizations left behind huge amounts of waste materials that are now polluting those areas.

By the way of humanitarian donations, the Federation of Bosnia and Herzegovina received vast amounts of drugs and medical materials which were past the expiry date and which now represent the burden and potential ecological bombs hard to neutralize without appropriate means (e.g. in Split, Mostar, Sarajevo, etc.)

Competent authorities on all levels of government in the Federation of Bosnia and Herzegovina, from municipalities to the Federation, are in trouble what to do with huge

amounts of food articles, which were sent as a humanitarian aid, but were past the expiry date upon the arrival. There is no money for their proper disposal, hence they are uncontrollably disposed off in illegal garbage dumps in vicinity of living areas, or in vicinity of water flows, hence contributing to the water and soil pollution.

Similarly, release of huge quantities of wastewater by different subjects into the water flows leads to their pollution and contributes to the pollution of environment, potable water supplies and supplies of water for industrial purposes.

2. Susceptibility

In the past ten year the intensity of different kinds of dangers (save for the war-related ones) decreased, mainly due to decrease in economic and industrial production volume of approximately 30-40% compared to 1991.

From the aspect of susceptibility to various dangers in the Federation of Bosnia and Herzegovina, danger to humans (especially children) from unexploded ordnance and other explosive devices is outstanding, especially in vicinity road communications, forests and cultivable agricultural lands.

Risk awareness of possible disasters and catastrophes will be increased by passing related legislation and normative regulation at the Entity level and by making danger estimates for the whole territory of the state. This would also serve as a basis for preparation of new plans for protection and rescue measures.