

## Interreg-IPA Cross-border Cooperation Romania-Serbia Programme

### JOINT STUDY EMERGENCY SITUATIONS RECAS-ZAGUBICA

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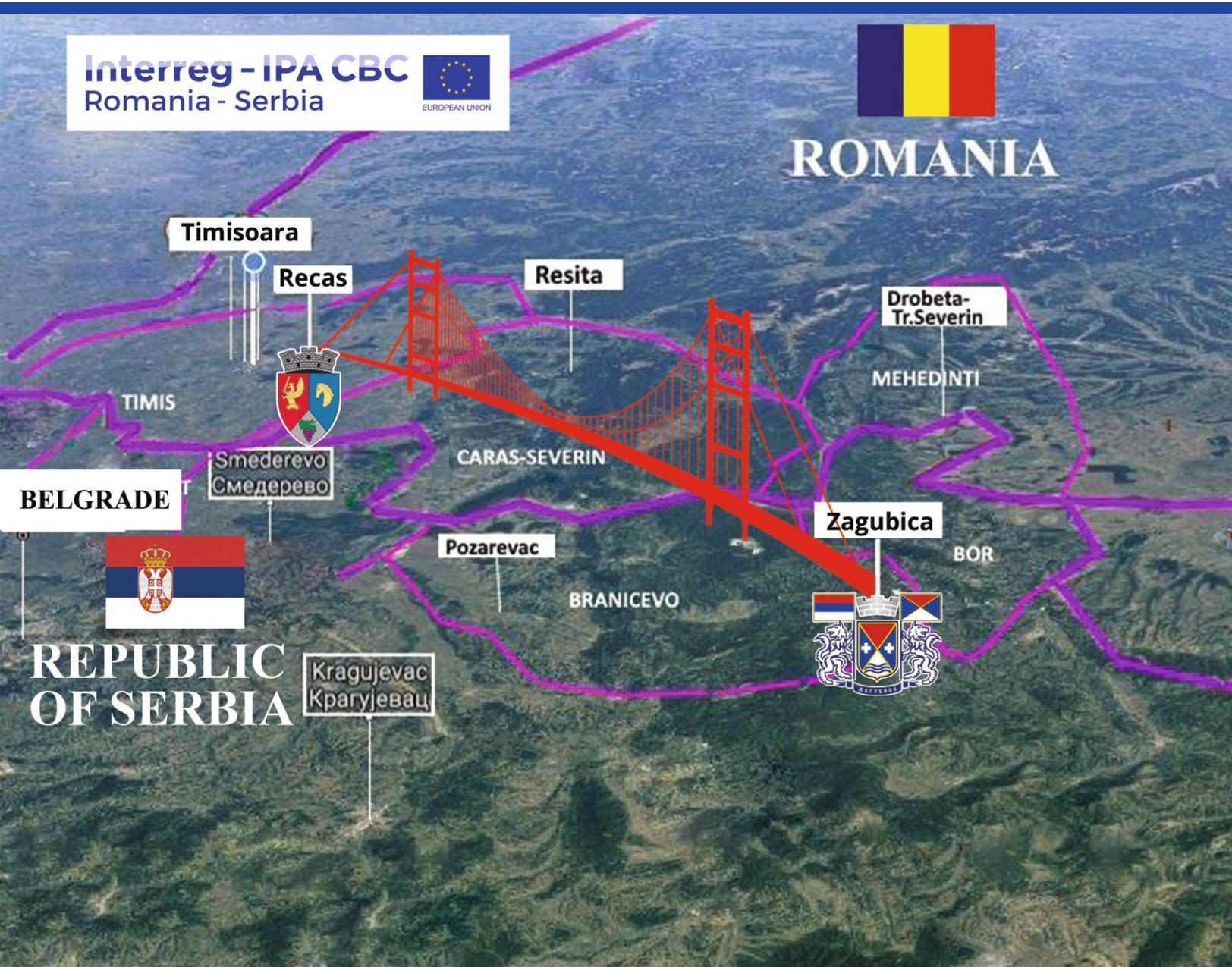
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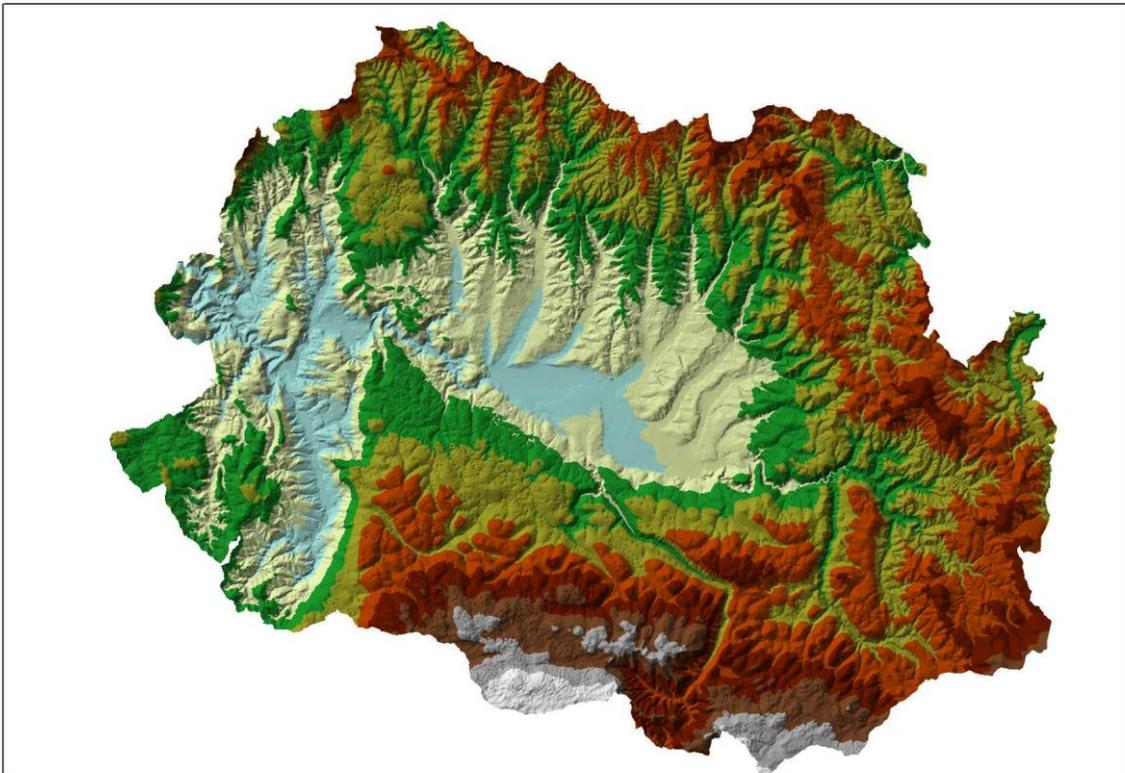
Implementation period: 30.05.2017 - 27.02.2019



Environmental protection  
and risk management







**DEVELOPMENT OF THE STUDY ASSESSING APTITUDE OF THE TERRAIN AND ECO-SYSTEM FOR OUTBREAK AND SPREADING OF FIRES AND ANALYSIS OF AREA CHARACTERISTICS FOR THE PURPOSE OF PREVENTION AND ADEQUATE PROTECTION AGAINST FIRES, FLOODING AND OTHER EMERGENCY SITUATIONS WITH PROPOSED MEASURES FOR LOCAL COMMUNITY AND POPULATION OF MUNICIPALITY ZAGUBICA.**

**BENEFICIARY: ZAGUBICA CITY HALL, BRANICEVO DISTRICT, SERBIA**

1. INTRODUCTION

During the 1970s about 700.000 people died in natural disasters, and that number today counts as high as 800.000 casualties. Droughts cause 33% of human casualties, flooding 32%, tropical cyclones 20%, which all are high percentages as compared to 4% of casualties caused by earthquakes.

Atmospheric phenomena in these damages participate with 84%: 32% from flooding, 30% from influence of tropical cyclones, 22% from drought. Earthquakes cause 10% of the damage, and the remaining 6% are caused by other natural disasters. These numbers undoubtedly indicate that something needs to be done in the system of preventive protection and mitigating the consequences of natural disasters.

Although every catastrophe is different, it is necessary to determine their reoccurrence. For that purpose, we need a database which will enable better understanding of the trends of catastrophes and natural disasters and their influences, helping make decisions related to prevention, measures of alleviating consequences and planning the future measures.

2. DAMAGES OF NATURAL DISASTERS IN SERBIA

The document "Study on Economic Benefits of RHMS of Serbia" (The World Bank study group, 2005, Belgrade, Serbia) records and estimates the average annual damages caused by hydrological and meteorological hazards<sup>1</sup> and unfavorable hydrological and meteorological events<sup>2</sup>.

Table 1. Sensitivity of the weather dependent economic sectors in Serbia

Sectors exposed to risks	Phenomena	Sensitivity
Agriculture and forestry	Hail, strong wind, floods, droughts, early and late frosts, forest fires	High
Production, transmission and distribution of electricity and heating energy	Extremely low or high air temperature, heavy and long-lasting precipitation, particularly freezing rain or wet snow, lightning processes, drought, forest fires	Relatively high
Transport (road, rail, river and air)	Fog, heavy and intensive rain, snow, glaze, freezing rain, ice on the rivers, forest fires	Medium, but high for air traffic
Civil engineering (road and bridge construction, river and lake engineering, building construction, etc.)	Strong wind and wind gusts, heavy precipitation, frost, lightning discharge	Relatively low
Water management	Droughts and floods	Relatively high
Tourism and trade	Each anomaly in relation to normal climatological cycle or weather	Medium

Already in 2005, the share of the weather-dependent sectors in the GNI of Serbia was 47.18%. The World Bank study included only 49% of the weather-dependent sectors and did not consider damages caused by forest fires. However, during 2007, 258 forest fires have been registered. Over 33.000 ha of vegetation has been burned of which 16.000 ha of forests. Forest fires have caused the total damage of approx. 40 million Euro. Rehabilitation only requires 24 million Euro. Indirect damage has not been estimated.

<sup>1</sup> Hydrometeorological hazards relate to hydrometeorological events, which by their intensity, duration or time of occurrence pose risks to human safety and may inflict a substantial damage on the economic sectors. These phenomena are viewed as hazardous when they reach critical values or characteristics of hydrometeorological values. (Source: "Study on Economic Benefits of RHMS of Serbia", The World Bank Study Group, 2005, Belgrade, Serbia)

<sup>2</sup> Unfavorable hydrometeorological events (weather conditions) refer to hydrometeorological events, which by their intensity, duration or time of occurrence do not reach critical values or characteristics of hydrometeorological values, but which may inflict damage to specific weather dependent economic sectors. (Source: "Study on Economic Benefits of RHMS of Serbia", The World Bank Study Group, 2005, Belgrade, Serbia)

Serbian economy suffers significant losses in material goods, but in Serbia, atmospheric disasters cause also losses in human lives.

Estimated damages in weather-dependent sectors, including the human casualties, clearly indicate that is necessary to work on improving the early announcement and warning system. This will contribute to strengthening resilience<sup>3</sup> and capacity<sup>4</sup> of the overall society in Serbia.

### 3. DATABASE OF LOSSES CAUSED BY CATASTROPHS

A large number of data on different aspects of natural disasters and technical and technological accidents that have occurred in Serbia over the past 20 years has been identified and gathered. The purpose of consolidating these data is the desire to possess quality data on losses caused by these catastrophes, as a method for measuring the risk, resilience, but also economics of risk reducing measures.

### 4. SEGMENTATION OF NATURAL CATASTROPHIES AND DISASTERS

There is a need for clearly defined procedures related to maintaining and regular updating of these databases of information systems.

Besides improved information base related to past events, it is necessary to further improve and harmonize information base in order to support other stages of the integrated risk management cycle.

All disasters are divided into two basic groups: natural disasters and technological disasters. Natural disasters are divided in six sub-groups: Geo-physical, Meteorological, Hydrological, Climatological, Biological and Extra-terrestrial disasters. Each of the mentioned sub-groups is further divided into basic types, sub-types and sub-subtypes of catastrophes.

#### **GROUP: NATURAL DISASTERS**

**Sub-group: Geo-physical disasters** (Dangers originating from Earth`s interior. Synonym is geological hazard). Basic types are: earthquakes, large shifting of the ground and volcanic activity).

**Sub-group: Meteorological disasters** (Danger caused by extreme weather and atmospheric conditions of short duration (from several minutes up to several days). Basic types are: extreme temperatures (cold wave, heat wave and winter conditions), fog and storm.

**Sub-group: Hydrological disasters** (Danger caused by occurrence, movement and distribution of surface and ground waters). Basic types: floods (river floods, currents and ice), landslides and wave activities (large waves and sudden change of water level).

**Sub-group: Climatological disasters** (Dangers caused by long-term influence of climate changes (drought and fires (forest fires and other open-space fires - shrubs, bushes, pastures)).

**Sub-group: Biological disasters** (Dangers caused by exposure to living organisms and their toxic substances or diseases they carry). Basic type: epidemy (viral, bacterial, parasitical, fungal), insects (grasshoppers, moth) and animals.

**Sub-group: Extra-terrestrial disasters** (Dangers caused by fall of asteroid, meteor and comet while passing nearby Earth, changes of interplanetary conditions affecting the Earth`s magnetosphere, ionosphere and thermosphere). Basic types: impact, fall (breakdown of meteor) and space conditions (energy particles, geomagnetic storm and impact wave).

#### **GROUP: TECHNOLOGICAL DISASTERS**

Basic types: industrial disasters (spill out of chemical matters, collapse, explosion, fire, gas leakage, poisoning, radiation and other), transport disasters (aerial, road, railroad and on water) and other disasters (collapse, explosions, fires and other).

<sup>3</sup> Resilience: Capacity to recover the normal functioning and development after being hit by a disaster. High resilience reduces the indirect impacts of disasters, such as business and services interruptions in the aftermath of a disaster. (Source: ISDR (International Strategy for Disaster Reduction) Terminology of disaster risk reduction)

<sup>4</sup> Capacity: A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. (Source: ISDR (International Strategy for Disaster Reduction) Terminology of disaster risk reduction)

**EARTHQUAKES**

In Serbia during 2002, 1 person died, 605 persons were endangered, and material damage amounted to 1.000.000\$, while in 2010 2 persons died, 27.030 persons were endangered and material damaged amounted to 132.260.000\$.

Use of the European Macro seismic Scale (EMS-98) with XII levels of intensity has been proposed for estimation of earthquake strength. Intensities of the earthquake above level VIII according to this scale cause catastrophes of different intensities.

**European Macro seismic Scale (EMS-98)**

**100 Earthquakes**

110 Intensity	Description
111 VIII	Most of the people find it difficult to stand. 25% of the houses is damaged, some weak structures collapse. Cracks occur at moist grounds and hillsides.
112 IX	General panic. Approx. 50% of houses is significantly damaged, many collapse, and most of them are not fit for further housing.
113 X	Approx. 75% of the constructions is heavily damaged, and most of them collapse. Cracks up to several centimeters wide occur in the ground. Rocks slide from the hillsides, creating large landslides in the ground.
114 XI	All constructed buildings collapse. Water with sand and mud penetrates through wide cracks occurring in the ground. Large slides occur.
115 XII	No artificial construction is sustained. Ground and relief change appearance, lakes fall in, river beds change.

Source: European Macro seismic Scale 1998 EMS-98, Editor G. Grünthal Chairman of the ESC Working Group "Macro seismic Scales" GeoForschungsZentrum Potsdam, Germany Associate Editors: R.M.W. Musson, British Geological Survey, Edinburgh, Great Britain J. Schwarz, Bauhaus University Weimar, Germany M. Stucchi, Istituto di Ricerca sul Rischio Sismico, C.N.R, Milan, Italy

**Territory of municipality Zagubica is not located within the earthquake vulnerability zone.**

**EXTREME TEMPERATURE EVENTS**

Analysis of the data base showed that heat waves were the most significant danger to have caused human casualties. Extremely high temperatures have become frequent, and extremely low temperatures are becoming more and more rare. It is anticipated that climate change will continue to raise the frequency and intensity of the heat waves, which could lead to significant consequences for human health. It is estimated that mortality is increased for 1-4% for every 1 °C of temperature which exceeds the threshold of extreme temperatures at particular locations.

In Serbia, there are no registered cases of extreme temperature events influencing the social community. This does not mean that these events didn't happened, but rather they were not reported as natural disasters by authorized institutions.

**STORMS**

Natural disasters causing the most damage are the storms. In terms of mortality, they follow immediately after heat waves, earthquakes and floods. In Serbia, the database registered the storm in 2005 which has hit the area of Tutin, Raska, Novi Pazar, Prijepolje and Sjenica, as well as the northern part of Montenegro. In the classification of types of storms, classification system the EM-DAT was adopted (Derecho-Land Hurricane; Devastating storm with hail; Lightning/Thunder; Rain; Tornado; Sand storm/swirl of dust; Winter storm/Blizzard; Storm/big waves and Wind.

**FLOODS**

Objective of the Directive on floods adopted by European Commission in 2007 (EC, 2007b) is to decrease the risk and damaging consequences caused by floods. It has been carried out in 3 phases:

1. The preliminary flood risk assessment (2011),
2. Development of flood hazard maps and flood risk maps of the affected zones (2013), and
3. Flood risk management plans (2015).

Besides this, Commission`s objective is to strengthen the links with existing early warning systems (European flood awareness system)

According to available information of the EM-DAT database, the following floods have been registered in Serbia: in 1999, 11 dead, endangered 70.678 persons, no data on damage; 2002 endangered 2.400 persons, no data on damage; 2005 2 human casualties, endangered 3.790 persons, no data on damage (Jasa Tomis, Zitiste); 2014 (Obrenovac, Southern Serbia) floods caused 55 human casualties, endangered 56.600 lives, and damage was estimated to 2.048.262.000\$.

## LANDSLIDES AND WAVV EFFECTS

Landslides are mostly local phenomena. It is in particular important to gather information on dangers of connected risks at the local level. Focus is on the preventive measures, which include land use planning and technical or biological protective measures (e.g. protective forests or green engineering and other).

## WATER SCARCITY AND DROUGHT (WSD)

There is a growing concern related to WSD events during the last few years. More and more countries experience seasonal or longer period of drought and water scarcity. This is not limited to the South of Europe. In many locations around the Europe, demand for water during the dry periods often exceeds the availability, as well as the need to provide adequate water supply system, while the sensitivity of the eco-system is being ignored. For Serbia, there is no information on droughts and consequences in data base EM-DAT, although they are present during the last decades.

## FOREST FIRES

Forest fires in Serbia are numerous, total area is large, especially during the fire years, but these fires were not assigned the category of natural disaster.

**Table 2.** Defining cause of fire and codes used during classification

<b>100 Unknown cause</b> Open space fires whose cause has not been identified.	
<b>200 Natural causes</b> All fires in open space caused in natural way, without any inclusion of human factor	<b>210 Thunderbolt</b> Fire caused directly or indirectly by a thunderbolt
	<b>220 Volcanic activity</b> Fire caused by volcanic activity
	<b>230 Gas emission</b> Fires caused by natural emission of gases (like in peatlands) which may lead to auto-ignition
<b>300 Accidents</b> Fires in open space which have been unintentionally or indirectly caused by people without use of flame, which have no connection with anyone`s intent or disregard	<b>310 Electrical current</b> Fire caused by arcing because of malfunctions on electrical network: short circuits, contact between cables, cables and vegetation or birds, cable collapse, etc.
	<b>320 Railroad</b> Fires caused by arcing of breaks or railroad electrical network
	<b>330 Vehicles</b> Fires caused by exhaustion gases and particles, breaks or traffic accidents
	<b>340 Works</b> Fires caused by spark from tools or machines in industry, forestry and agriculture or by ignition of flammable vapors during performance of industrial activities
	<b>350 Weaponry</b> Fires caused by military exercises or other use of firearm or explosions during the job performance. Fires caused after the explosion of residual ordnance in the ground from the previous conflicts, also fall in this category.
	<b>360 Auto-ignition</b> Fires caused by auto-ignition of vegetative waste or other products left in piles

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	<p><b>370 Other accidents</b>                  Fires caused in manner different from abovementioned. This class encompasses fires that have occurred due to Sun`s influence, since the Sun itself may not cause fire, but needs some object like piece of glass. Causes such are "glass", "friction", "chemically induced thermal reaction" or "auto-ignition of coal" also fall in this category.</p>	
<p><b>400 Disregard</b>                  Unintentionally caused fires occurred during use of flame or incandescent objects</p>	<p><b>410 Use of flame</b>                  Fires caused unintentionally during cleaning of the land or for recreational purposes. Difference between this category and intentional ignition of fire is that the flame has been ignited for certain needs, and not to destroy natural area. In order for the fire to be classified in this category, the fire must "get out of control".</p>	<p><b>411 Managing vegetation</b>                  Fire caused by any kind of burning the vegetation from private, forestry reasons or for restoring pastures, including also prescribed burning, burning of forest debris, piles of plant waste except for the agricultural reasons</p>
		<p><b>412 Agricultural burning</b>                  Fires caused by all types of agricultural burning</p>
		<p><b>413 Waste management</b>                  Fires caused by burning at official or illegal landfills, including industrial, private and commercial landfills</p>
		<p><b>414 Recreation</b>                  Fires caused by recreational activities (excursions, fishing, hunting, hiking), igniting barbecue, camp fires and similar.</p>
		<p><b>415 Other fires caused by careless use of flame</b>                  Fires incurred by use of fire for the needs different from abovementioned</p>
	<p><b>420 Use of incandescent objects</b>                  Unintentionally caused fires incurred by use of the incandescent objects: fireworks, cigarettes, incandescent ashes, beekeeping, disinfection and pest extermination or ejection of incandescent particles through a chimney</p>	<p><b>421 fireworks, firecrackers and signal flares</b>                  Fires caused by fireworks with or without preventive measures, firecrackers and signal flares regardless of who fired them</p>
		<p><b>422 Cigarettes</b>                  Fires caused by cigarettes, tobacco pipes regardless of the activities or location of the smoker. These include also fires caused by matches which were carelessly discarded, but not the cases when cigarettes and matches were used for deliberate arson</p>
		<p><b>423 Incandescent ashes</b>                  Fires caused by incandescent ashes after the barbecue of camp fires. This class is associated with recreational activities</p>
<p><b>424 Other use of incandescent objects</b>                  Fires incurred by the different use of incandescent objects than already mentioned. This class includes fires incurred during beekeeping activities, disinfection and pest extermination or ejection of incandescent particles through a chimney.</p>		
<p><b>500 Intent</b>                  Fires in an open space deliberately caused by people using flame</p>	<p><b>510 Fires which bear responsibility (arson)</b>                  Fires which have been deliberately ignited by adults and are spreading to vegetation or the property without consent of the owner</p>	<p><b>511 Interest (profit)</b>                  Fire ignited for profit whether it is direct financial gain or other reasons: fraud, insurance, cleaning of a parcel and other</p>
		<p><b>512 Conflict (retaliation)</b>                  Fire ignited for personal, social, institutional, group revenge or intimidation</p>
		<p><b>513 Vandalism</b>                  Malicious and harmful arson resulting in damaging of the property</p>
		<p><b>514 Excitement</b></p>

		Fires ignited with objective to gain attention and significance. Seeking thrill, recognition, affirmation, out of boredom. This class also includes fires ignited in order to admire fire extinguishing activities
		<b>515 Concealing crime</b> Fires ignited in order to cover the evidence of crime. Fires which are intentionally ignited as diversions aimed at diverting attention from something else, also fall in this class
		<b>516 Extremists</b> Fires ignited from political, social or religious motives
		<b>517 Unknown motives</b> Fires ignited by the people who may be held accountable but without known motives
	<b>Fires which bear no responsibility</b> Fires caused by persons who do not account for their actions since are underage or mentally ill	<b>521 Mental illnesses</b> Fires caused by mentally ill persons, including pyromania
		<b>522 Children</b> Fires caused by children (underage) play or fun
<b>600 Re-ignition</b> Fire caused by re-ignition of the previous fire due to latent heat or ember		

## BIOLOGICAL DANGERS (EPIDEMICS, INSECTS AND ANIMALS)

Biological dangers imply danger caused by exposure to living organisms and their toxic substances or diseases they carry. Dangers caused by gradation of harmful insects are also included here.

## EXTRA-TERRESTRIAL DANGERS

Extra-terrestrial danger implies danger caused by fall of asteroid, meteor or comet while passing by the Earth, entering Earth`s atmosphere, and/or hit the Earth, as well as the changes of interplanetary conditions who affect Earth`s magnetosphere, ionosphere and thermosphere.

## INDUSTRIAL ACCIDENTS AND TOXIC SPILL-OUTS

In classification system, technological accidents encompass industrial accidents – code 7000, transport accidents – code 8000 and other accidents – code 9000.

## 5. RISK MANAGEMENT IN PROTECTION OF FORESTS FROM FIRE

The possibility of occurrence of wide-scale fires, endangering human lives and material goods, as well as the danger of lasting degradation of environment, influence certain actions and activities to be properly chosen and directed, so that primarily by preventive acting, the risk of forest fires is minimized and when the fire occurs an adequate response is prepared, and damages and consequences of the occurred fire are minimized.

Large share of forest fires as well as the sizes of burnt surfaces show that current system for protection of forests from fires is not adequate, it`s functionality is low and does not give results. Large number of fires and burnt surfaces, directly or indirectly influences significant material damages and numerous other unwanted side effects.

## PLANNING MEASURES TO FIGHT POTENTIAL CAUSES OF FOREST FIRES

Statistical data show that in Serbia, over 94% of forest fires is caused by man, mostly out of ignorance, involuntary or deliberately. In 2% of the cases, causes of forest fires relate to natural phenomena or some other causes, and the number of fires for which the cause is not determined is not insignificant as well.<sup>5</sup>

<sup>5</sup> According to official data of FAO (2002) for the area of Europe, for the period from 1991 to 2001 number of fires for which the cause has not been determined amounts to as much as 40%, while for the period from 1950 to 1991 the share of fires of the unknown cause is 43% of the total number. Some theories and researches link a large share of these fires to activity of the highthermal protons, nucleons and electrons of solar origin.

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In order to decrease the number of forest fires, during the fire season it is necessary to influence the population's education level with pedagogic, educational and propaganda measures. By various warnings, instructive lectures and presentations, it is possible to influence people in order to reduce the occurrence of forest fires. Educational, propaganda and warning measures are achieved with appropriate engagement in schools and media (printed media, radio and television) at local, regional and national level.

### **PLANNING BIOLOGICAL AND TECHNICAL MEASURES FOR PROTECTION OF FORESTS FROM FIRES**

These measures enable an increased self-regulating defense mechanism of forests and decrease their threat of fires. That is in particular important for forests of the first and second degree of endangerment, but it is desirable to be applied to other forest stands.

Objective of planting the mixed forests is to avoid creation of forest composed of single species of trees at surfaces being afforested, as it presents easily flammable burning material.

**All biological and technical measures of protection are intended to create conditions which will make difficult the spreading of the occurred fire and also enable conditions for successful extinguishing of the fire.**

### **EQUIPMENT AND MEANS FOR EXTINGUISHING THE FOREST FIRES**

All types of forest fires may be extinguished by using the same equipment and extinguishing means. Efficacy depends on proper and adequate choice of equipment and extinguishing means.

The choice of equipment and extinguishing means is influenced primarily by: type of fire, type of vegetation, condition of burning material, orographic characteristics, weather conditions, road conditions (accessibility, passability), manner of storing the equipment (central storage, possibility of dispersion). Intensity and velocity of the fire spreading may also significantly influence the choice of equipment.

### **CLASSIFICATION AND DIVISION OF EQUIPMENT AND MEANS FOR EXTINGUISHING THE FOREST FIRES**

Equipment for extinguishing the forest fires may be divided into:

- 1) Equipment for extinguishing by cooling;
- 2) Equipment for extinguishing by oxygen reduction;
- 3) Equipment for removal of burning material.

Accurate delimiter in this division of extinguishing equipment is not possible to determine, since most of the equipment may function in multiple ways (equipment for extinguishing by water may also have cooling and oxygen reducing effect and similar).

### **USE OF GIS FOR RISK ASSESSMENT IN PROTECTION OF FOREST FROM FIRES**

Method for determining the degree of fire threat is the most important element for development of forest fires protection plans.

Degree of forest fire threat is not the same for all forests. It depends on series of factors whose influence individually determines the threat degree. Preventive and oppressive acting directly depends on the forest fire threat degree. Knowledge of this degree enables timely and efficient protection of forests. The size of the burnt surface directly depends on the organization and readiness of the actors involved in protection of forests.

A growing number of open space fires (which include the forest fires) require more organized and systematic approach. Risk of occurrence of forest fires is defined as a function of probability of occurrence of unwanted event and possible consequences. Probability of occurrence of the forest fires is always present and by certain preventive and organizational measures, we may anticipate these unwanted events and take appropriate measures to prevent their occurrence. This is achieved by risk management in protection of forests from fires.

## CREATING GIS

Spatial data within the geo-database are organized according to the following thematic units:

### Orographic characteristics:

- Digital model of the terrain
- Map of altitude
- Map of exposure
- Map of slope
- Map of soil water erosion index
- Map of thermal levels
- Map of exposure and slope thermal coordinate

### Climate data:

- Map of median annual air temperature
- Map of median annual amount of precipitation
- Map of median annual relative humidity
- Dry period
- Hydrological map with water sources

### Geological and pedological maps:

- Map of geological characteristics
- Map of pedological characteristics

### Vegetation:

- Map of types of forests
- Map of forest stands by level of degradation
- Map of forest stands by age
- Map of state of barren land

### Burning material:

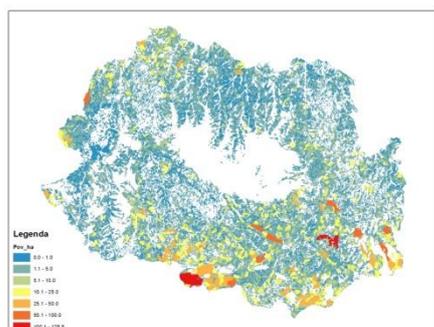
- Map of dead trees
- Map of forest margin at the border of forest/non-forest

### Isokeraunic map

### Anthropogenic influences:

- Map of anthropogenic influence
- Map of history of fires
- Map of opening of the forest
- Map of natural resources
- Map of tourist objects
- Map of development level of the forest complex
- Level of development of space for tourist and excursion activities

At aerial photos of the territory of Zagubica, total of 26.476 homogenous wholes were singled out by the method of visual interpretation.



**Map 1.** Homogeneous wholes grouped by surface

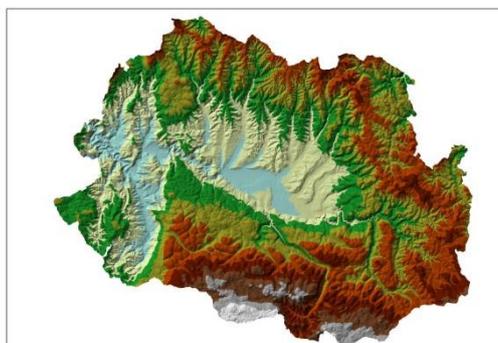
## Orographic characteristics

Orographic characteristics are decisive factors and modifiers of ecological circumstances, significant in prevention and extinguishing of the fire, cultivation of burnt vegetation and rehabilitation of the fire location.

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The slope of the terrain affects creation of the local climate, soil and plant covers. At steep south localities, vegetation develops significantly faster, warming-up and dryness of the air is stronger, and burning material often lacks moisture. At northern localities, vegetation develops slower, withers slower, and contains higher level of moisture within, which significantly influences the threat of fire occurrence.

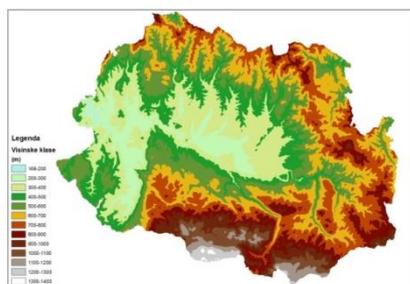
- Fire spreads two times faster at the steep slope (40°) than at the medium inclined terrain (28°) or 2:1
- Fire spreads four times faster at steep (35°) than at the mild slope or 4:1
- The fire spreads 16 times faster up the slope (40°) than down the slope or 16:1
- Fire will progress up the mild slope (8°) three times faster than down the mild slope or 3:1



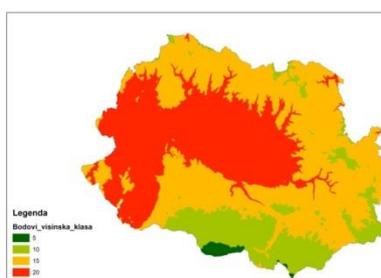
**Map 2. Digital model of terrain (DMT)**

**Table 3.** Surfaces of homogenous wholes by altitude classes and number of points

Altitude class	Number of points	Surface (ha)	(%)
<500	15	27154,8	35,73
500-800	10	36670	48,25
>800	5	12175,2	16,02



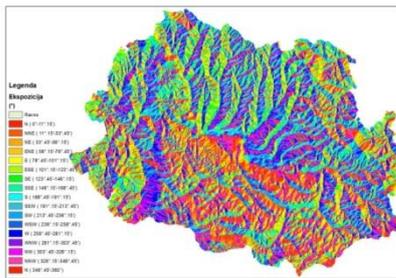
**Map 3. Altitude classes**



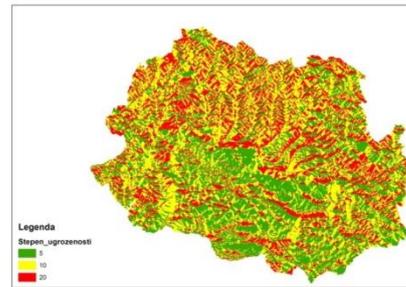
**Map 4. Altitude classes by points**

**Table 4.** Surfaces of homogenous wholes by exposure and number of points

Exposure class	Number of points	Surface (ha)	(%)
South and plains	20	21112,8	27,78
Eastern and Western	10	25376,4	33,39
Northern	5	29510,8	38,83



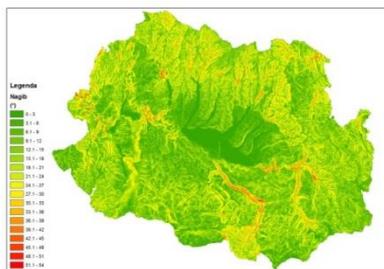
Map 5. Exposure



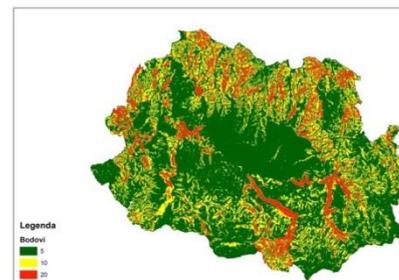
Map 6. Exposure classes with points

Table 5. Surfaces of homogenous wholes by slope and number of points

Terrain slope		Number points	Surface (ha)	(%)
from	To			
0	15	To 15%	42278,8	55,63
15	30	From 15-30%	31061,2	40,87
30	45	From 31-45%	2629,6	3,46
45	54	Over 45%	30,4	0,04



Map 7. Slopes



Map 8. Slope classes with points

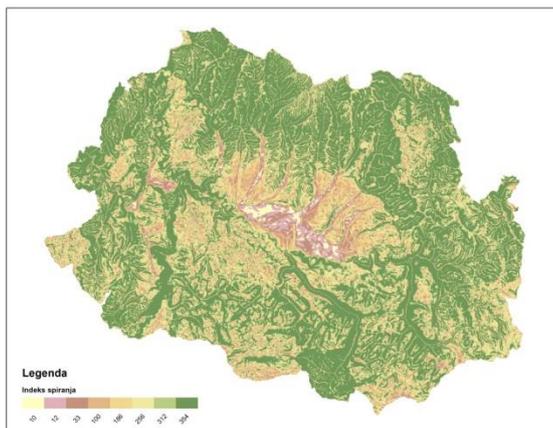
Slope affects the soil water erosion. If the soil water erosion with slope of 10% is marked with the index 100, soil water erosion at other slopes is provided in the Table 6 (Djordjevic, G. 2012).

Table 6. Index of water erosion of the soil in relation to slope

Slope %	1	2	5	10	15	20	25	30	>30
Index of water erosion	10	12	33	100	186	256	312	354	>354
Surface	577,6	1216	2728,4	6110,4	8420,8	9629,2	10062,4	9393,6	27861,6
%	0.76	1.60	3.59	8.04	11.08	12.67	13.24	12.36	36.66

Terrain water erosion affects type and quantity of the burning material at certain surface, as well as the possibility of movement and communication in the areas that are threatened or caught by fire (Map 9).

**Thermal levels by altitude (coordinate V).** Coordinate V depends on altitude of the terrain. The highest value (18) have thermal coordinates of the terrain of 99 m above sea level, and terrains over 1.800 m above sea level have value 0 (Table 7).

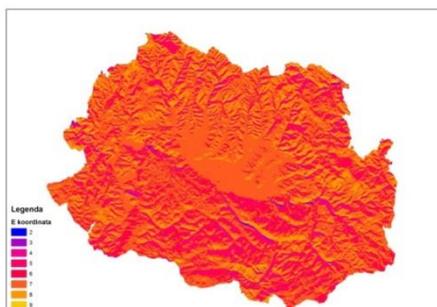


Map 9. Index of water erosion

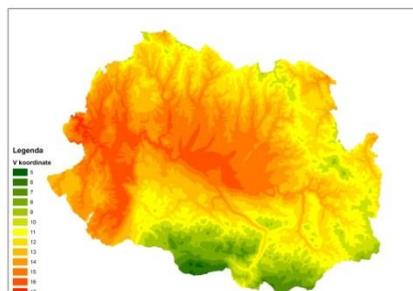
**Exposure and slope thermal coordinates (coordinate E).** Coordinate E is obtained based on combining the exposure and slope, which are grouped in nine thermal levels. First group consist of combinations with the smallest annual sum of solar radiation and are marked with 1. Groups with the largest annual sum of solar radiation have the value of thermal coordinate 9 (Lujic R., 1960).

Table 7. Thermal levels (V) and thermal coordinates (E)

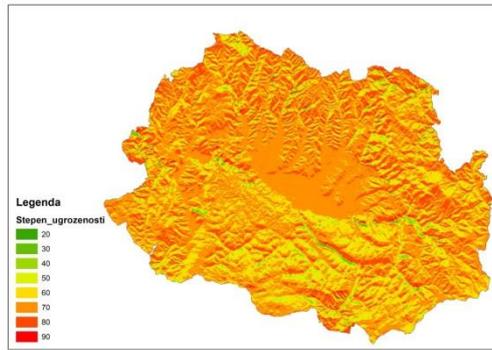
Thermal levels V	Surface (ha)	Percentage	Thermal coordinate E	Surface (ha)	Percentage
5	83,6	0,11	2	30,4	0,04
6	600,4	0,79	3	250,8	0,33
7	1238,8	1,63	4	1770,8	2,33
8	2135,6	2,81	5	6976,8	9,18
9	2888	3,80	6	16340	21,50
10	5228,8	6,88	7	36396,4	47,89
11	11476	15,10	8	14014,4	18,44
12	13102,4	17,24	9	228	0,30
13	12091,6	15,91			
14	10077,6	13,26			
15	11324	14,90			
16	5601,2	7,37			
17	152	0,20			



Map 10. Coordinate E



Map 11. Coordinate V

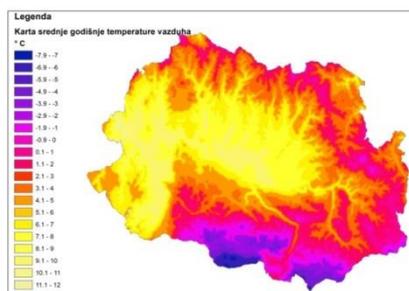


Map 12. Threat map Coordinate E

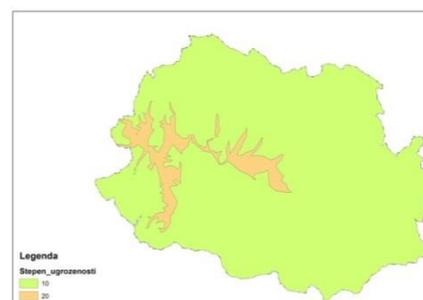
## Climate characteristics

Table 8. Parameters of impact of climate elements on forest fires

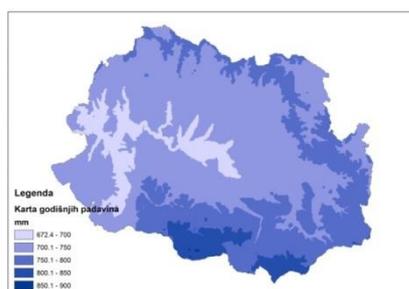
Climate characteristics	Number of points	P (ha)	%
<b>Median annual air temperature</b>			
Over 12 °C	30		
Between 9,1-12,0 °C	20	2280	3
Up to 9,0 °C	10	73720	97
<b>Total</b>			
<b>Median annual amount of precipitation</b>			
Up to 800 mm	30	70680	93
Between 801-1200 mm	20	5320	7
Over 1200 mm	10		
<b>Total</b>			
<b>Median annual relative humidity</b>			
Up to 70%	30		
Between 71-80%	20	76000	100
Over 80%	10		
<b>Total</b>			



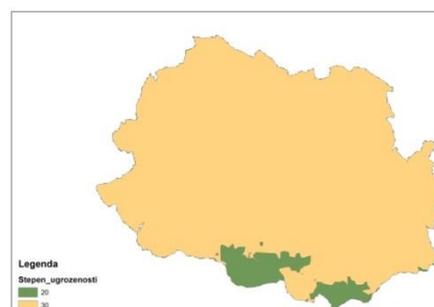
Map 13. Median annual air temperature



Map 14. Map of points



Map 15. Annual sum of precipitation

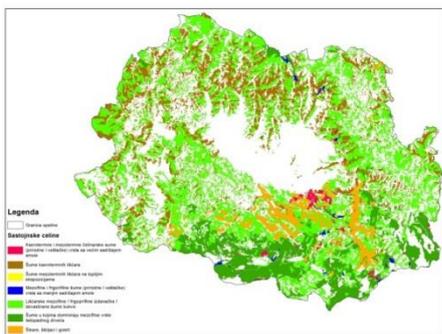


Map 16. Map of points

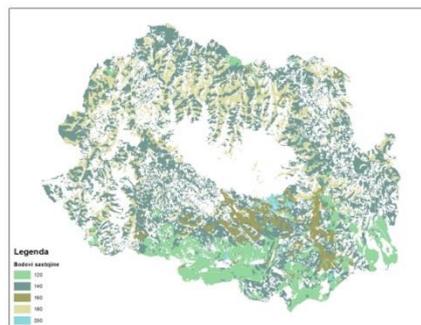
**Vegetation and burning material**

Forests may be classified differently (by the type of trees, manner of cultivation, age, purpose and similar), but most commonly are divided into: coniferous forests, deciduous and mixed forests. Special forms such as: bush, shrub, macchia, garrigue, and degraded forest are also taken into consideration, due to their specifics in the context of fire sensitivity. Within further division of vegetation, artificially cultivated woodlots (cultures) are singled out as a special category regardless of age, since the age affects the forest fire threat (with an increase of age, level of threat of fire reduces with natural forests), whereas with cultures, that difference is within the limits of negligibility. Further division of natural coniferous forests, deciduous and mixed forests has been carried out according to request for light and according to age, although other properties of particular types of forests also influence their fire threat (content of resin, tannin, essential oils, forest stand, ground vegetation).

Map 17 shows vegetation wholes and Map 18 vegetation wholes by points.



**Map 17.** Map of forest stands



**Map 18.** Map of points

Vegetation analysis in particular singled out forest habitats according to age classes (Table 9), level of degradation (Table 10) and state of barren land (Table 11).

The column age is inserted with age (in years) of species detected in homogenous whole. Age of the trees is closely linked to basic parameters of the forest stand structure, cultivation needs and production characteristics of the forest.

**Table 9.** Age of forest stands, number of points and surface representation

Age of forest stands	Number of points	Surface (ha)	%
Up to 30 years	80	2327,30	6.39
Between 31 and 60 years	60	364,21	1.00
Over 60 years	40	33729,49	92.61

Degraded forest stands include forests with expressed degradation of stands and habitats. This group of fire threat includes bush and shrub, as well as partially the forests of xerothermic and mesothermic deciduous trees in warmer exposures.

**Table 10.** State of forest stands by level of degradation

State of forest stands by level of degradation	Number of points	Surface(ha)	%
Degraded forest stands	100		
Bushes and shrubs	160	2327,30	6.39

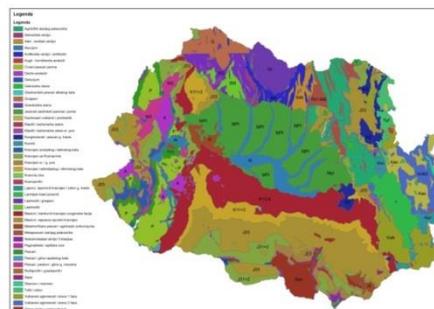
State of barren land by scoring system defines the level of threat from fire in an open space. In most cases, it presents a danger of the fire at these areas to be transferred to surrounding forests, which is later defined by the state of contact forests/non-forests zones.

**Table 11.** State of barren land and number of points

State of barren land	Number of points
<b>II category</b>	
Barren lands at warmer exposures densely covered with ground vegetation	180
<b>III category</b>	
Barren lands at shade sides densely covered with ground vegetation	140
Barren lands at sun sides less covered with ground vegetation	
<b>IV category</b>	
Barren lands densely covered with ground vegetation dominated by <i>Vaccinium myrtillus</i> , <i>Vaccinium vitis-ideus</i> , <i>Vaccinium uliginosum</i> , <i>Arctostaphylos uva-ursi</i> and similar perennial plants	120
<b>V category</b>	
Barren lands more or less without ground vegetation	40
Barren lands where ground vegetation is dominated by moss (in particular <i>Sphagnum sp.</i> and <i>Hylocomium sp.</i> ) or ferns <i>Equisetum sp.</i>	20
Smaller marsh areas regardless of level of coverage and content of vegetation	10

### Substratum (parent substrate and type of soil)

Geological substratum and type of soil affects forests fires threat. Content of moisture in burning material (needles, leaves, branches), as well as the type of soil influence the state of water and water retention in ground and inner layers, which affects combustibility and threat to burning material in the forest. Level of combustibility of vegetation at the land surface depends on dryness and waterless of the terrain, which is especially distinctive during the warmest months. At these terrains extinguishing of fire is difficult, since usually there are no sources of water that might be used for extinguishing.



**Map 19.** Geological map

**Table 12.** Division of types of soil and impact to the level of threat of forest fire

Type of soil	Sub-type	Number of points	Surface (ha)	%
<i>I - (A)-C or (A)-R undeveloped</i>				
Rocky terrain (Lithosol)		80	752,4	0,99
Skeletoid and skeletal soils			843,6	1,11
Skeletoid soil			5532,8	7,28
<i>II - A-C or A-R (Humus-accumulative)</i>				
Limestone-dolomite black soil (Calcomelanosol)	Browened	60	5601,2	7,37
Humus silicate (Ranker)		60-80	129,2	0,17
Smonitza (Vertisol)		60	570,0	0,75
<i>III - A-(B)-C or A-(B)-R (Cambic)</i>				
Eutric brown (Eutric cambisol)		40	927,2	1,22
Dystric brown or acidic brown (Dystric cambisol)		20-40	29564,0	38,90
Brown on limestone and dolomite (Calcocambisol)		40-60	2432,0	3,20
<i>IV - A-E-B-C or A-E-B-R (Fluvial iluvial)</i>				
Ilimerised (Fluvisol)		40	1634,0	2,15
Hydromorphic				
Pseudogley		40	1558,0	2,05
Fluvial or alluvial (Luvisol)		20	5669,6	7,46



**Table 15.** Type of forest margin

TYPE OF FOREST MARGIN	Surface (ha)	%
Forest margin is a glade, culture, sapling or dwarf coniferous at the upper forest margin or similar.		
Trees with normally developed crowns are situated at the forest margin (trees are not branched), without layer of bushes or with only sporadic bushes.		
Forest margin is composed of branched trees without layer of bushes or with sporadic bushes (partial cloak of tree crowns).		
Forest margin is composed of trees and bushes (steep cloak of the stand)	36421.0	100
Forest margin is cascading, in front of the taller trees there is a belt of lower trees and bushes (cascading cloak of the stand).		

Density of the forest margin is determined up to depth of 10 m from the forest margin, by viewing the grounds which are not forest in interior of the stand. It is evaluated with percentage of coverage by bushes and lower tree branches of the profile of the stand up to 2 m of height (Table 16).

**Table 16.** Density of the forest border

Density of the forest border	Number of points	Surface (ha)	%
Open forest margin, coverage 0-25 %	10		
Thin forest margin, coverage 26-50 %	20	36421.0	100
Medium dense forest margin, coverage 51-75 %	30		
Dense forest margin, coverage 76-100 %	40		

Shape of forest margin. Forest margin may be of different shape (straight line, irregular and very irregular) (Table 17).

**Table 17.** Shape of forest margin

SHAPE OF FOREST MARGIN	Surface (ha)	%
Forest margin is straight line		
Forest margin is of irregular shape (wavy, round)	36421.0	100
Forest margin is of very irregular shape		

Depth of forest margin – total depth of forest margin is evaluated, showing the structure different from the interior of the stand. It is expressed in a manner presented in Table 18.

**Table 18.** Depth of forest margin

DEPTH OF FOREST MARGIN	NUMBER OF POINTS	Surface (ha)	%
Forest margin is narrower than 10 m	10		
Forest margin is wider than 10 m	20	36421.0	100

Presence of bushes at the forest margin and its width is also evaluated (sporadic presence of bushes with coverage less than 5% is not considered) (Table 19).

**Table 19.** Presence of bushes at forest margin

Presence of bushes at forest margin	Number of points	Surface (ha)	%
Bushes belt does not exist	0		
Bushes belt is narrower than 10 m	5	36421.0	100
Bushes belt is wider than 10 m	10		

## ISOKERAUNIC MAP

Although natural phenomena that may cause forest fires have share of approx. 1% of all forest fires causes, these phenomena also need to be considered. There are areas under influence of certain natural phenomena

which in particular periods may be frequent cause of forest fires occurrence. The most common natural phenomena causing forest fires is atmospheric discharge or thunderbolt, as well as effect of solar heat when comes across a specific focus and ignites most often dry grass as a burning material. Table 20 presents number of thunderbolts and threat level expressed in points.

**Table 20.** Number of thunderbolts and threat level expressed in points

Number of thunderbolts	Threat	Number of points	Surface (ha)	%
Up to 32	Low	0		
Between 33 and 36	Existing	10		
Above 36	Significant	20	36421.0	100

**MAPS OF APPLICABLE EQUIPMENT FOR EXTINGUISHING FOREST FIRES**

Maps of applicable equipment for extinguishing forest fires need to be an integral part of all forest fires protection plan. as the efficiency of extinguishing forest fires depends on the choice of appropriate equipment and extinguishing means, these equipment needs to be presented at all operational maps.

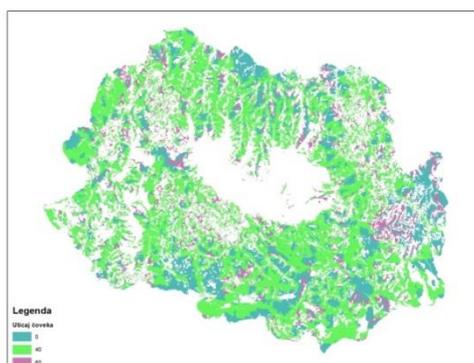
**ANTROPOGENIC INFLUENCES**

Almost 98% of forest fires are indirectly or directly related to human activity. Presence of men in the forest as shepherd, tourist, harvester, and hunter increases threat of fire in the forest. Special threat occurs if man’s activities are related to ignition of fire: burning of stubble, plant waste and use of fire in the forest for any purpose. Therefore, the men caused risk holds significant place as a level of fire threat for forests.

**Table 21.** Parameters of human influence to occurrence of forest fires

Category 1	Number of points	Surface (ha)	%
Tourist and forests used for recreation, as well as forests situated nearby agricultural land and landfills	60	4780.7	11.0
Category 2			
Forests through which pass public roads, powerlines or are used for pasture	40	28004.1	63.0
Category 3			
Forests used for harvesting forest fruits, hunting and fishing, as well as farming works	20		
Uncategorized	0	11690.8	26

In a case the forest according to the risk of men classifies in multiple categories, then the influence of all these factors to threat of forest from fires is expressed through a total number of points.



**Map 22.** Map of anthropogenic influence

## History of fire and its influence on threat of forests fires

The history of fires, i.e. number of fires during specific timeframe in particular area, influences the determination of the level of threat of forests fires. Namely, the sole number of fires in observed area shows which part of the space is more susceptible to occurrence of fire and which is greater threat of forest fires. Also, burning material is not the same in the areas more susceptible to occurrence of fires, since the weather conditions affecting the state of burning material more susceptible to ignition also change.

Table 22 provides some characteristics of determining the threat level of fires, related to frequency of fires at observed surface during the time period of 10 years.

**Table 22.** Number of open space fires, burnt surface and number of points by Local communities

Local community	Number of fires	Burnt surface	Number of points
Izvorica	1	1	10
Laznica	1	53	10
Seliste	1	5	10
Josanica	6	47	40
Suvi do	8	29	40
Vukovac	9	48	40
Milatovac	3	11	20
Osanica	5	35	40
Krepoljin	6	35	40
Bliznak	8	149	40
Sige	3	215	20
Ribare	10	31	40
Krupaja	3	22	20
Breznica	1	4	10
Zagubica	57	986	40

## Opening of forest complex

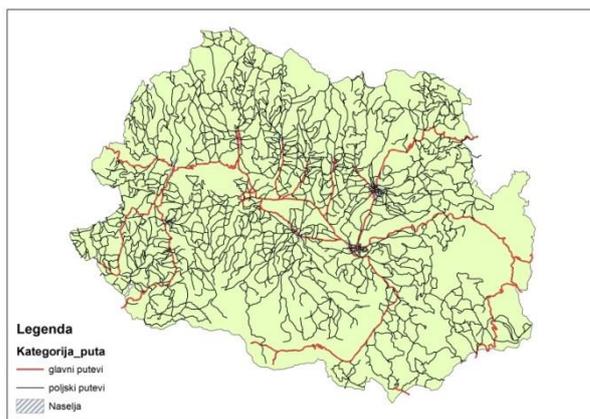
Opening of the forest complex by roads presents the basis for successful prevention of occurrence of forest fires.

This also includes development of firebreaks where cleaning and pruning of the branches is done, as well as thinning and reduction of the burning materials. Opening of the forest complex is presented in the Table 23.

**Table 23.** Opening of the forest complex

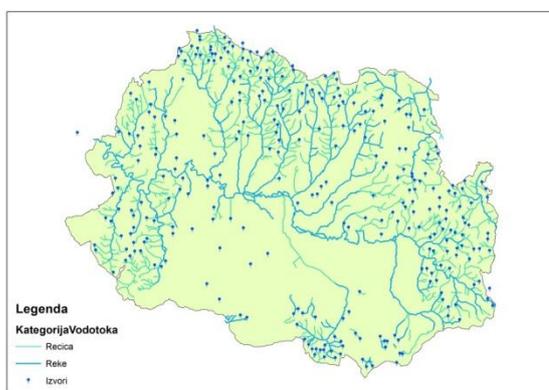
Opening of the forest complex	Number of points	Surface (ha)	%
Forest complex is open (most of the surfaces is accessible by constructed road network, firefighting trails are regularly maintained)	5		
Forest complex is partially open (larger parts of the forest complex are poorly accessible or are accessible by forest paths unsuitable for firefighting vehicles; firefighting trails are poorly maintained)	20	36421.0	100
Forest complex is not open, there are no firefighting trails	40		

Map 23 shows the road network of municipality Zagubica.



**Map 23.** Road network

Map 24 shows hydrographic network and water sources.



**Map 24.** Hydrologic network and water sources

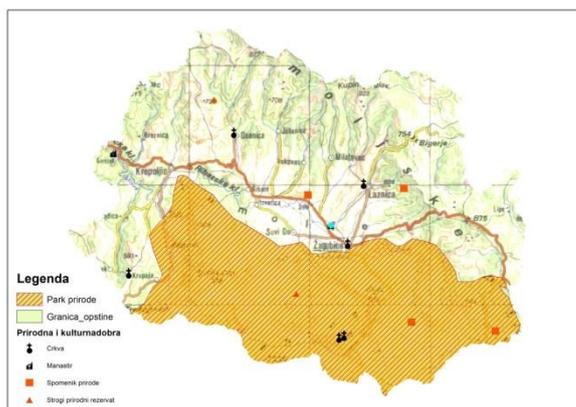
**Level of development of space for tourist and excursion activities**

Due to large number of people, firing and usage of different means for ignition of fire, excursion sites present a special threat and risk of occurrence of fire. Developed excursion sites imply those which have constructed and arranged sites for building a fire, possess means for extinguishing and fire protection, organized keepers service designated to monitor and guide activities at the excursion sites and warns of actions that may cause fire (Table 24).

**Table 24.** Level of development of the space and number of points

Level of development	Number of points	Surface (ha)	%
Forest complex is developed for tourist and excursion activities (sites for building a fire are marked and secured, barrels with sand for extinguishing small scale fires in initial phase of their development are in place, signs of forest fires threat are in place)	5		
Forest complex is partially developed for tourist and excursion activities (signs of forest fires threat are in place)	20		
Forest complex is completely undeveloped for tourist and excursion activities (there are no marked sites for building a fire or signs of forest fires threat in place)	40	36421.0	100

Map 25 show natural and cultural resources.



**Map 25.** Map of tourist objects and protected natural resources

### Other biotechnical protection measures

Other biotechnical measures of protecting forests from fires are applied: planting mixed forests, burning material which is less threatened by fires, construction of firefighting trails and their regular maintenance, construction of water supply sites and their maintenance, construction of observation posts and organization of the forest monitoring system, development and implementation of the system for assessment of fire occurrence threat (Table 25).

**Table 25.** Level of development and number of points

Level of development	Number of points	Surface (ha)	%
Forest complex has ensured biotechnical protection measures (mixed forest representation, burning material which is less threatened by fires, constructed firefighting trails, developed water supply sites and their maintenance, construction of observation points and organization of the forest monitoring system, development and implementation of the system for assessment of fire occurrence threat)	5		
Forest complex has no ensured biotechnical protection measures	40	36421.0	100

### LEVEL OF THREAT OF FORESTS BY FIRES

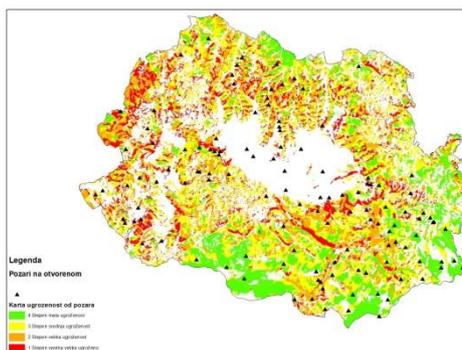
Based on presented parameters for assessment of threat of forest fires for observed area number of points of all represented parameters is summarized and based on the number of points, threat of forest fires is determined. Table 26 provides categorization of threat of forest fires based on the number of points.

**Table 26.** Categorization of threat of forest fires

Level of threat of forest fires	Total number of points	Color	Surface (ha)	%
First level-very high threat	415-495	Red	6567,97	15%
Second level-high threat	496-530	orange	12246,10	28%
Third level-medium threat	531-570	yellow	15139,06	34%
Fourth level-small threat	571-650	Green	10426,85	23%

## JOINT STUDY EMERGENCY SITUATIONS RECAS-ZAGUBICA

Map 26 shows threat of forest by fires according to categories expressed in points of related homogenous wholes.

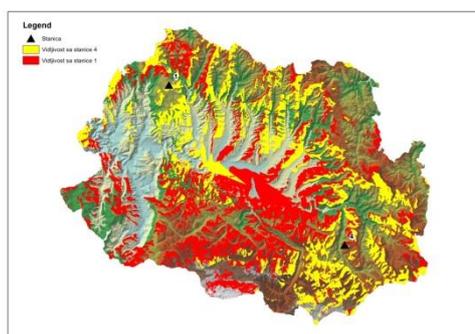


**Map 26.** Threat of forest fires by categories

### LOCATING CAMERAS AND VISIBILITY ZONE

Reduction of damages caused by open space fires is performed through three preconditions applying automatic observation systems and data gathering, namely:

1. Early notice of fire, already in the occurrence phase
2. Timely and fast undertaking of necessary actions related to extinguishing fire, which require objective and relevant information
3. Noticing and sanctioning of deliberately caused fires



**Map 27.** Map of located cameras and visibility zone

These kinds of detection systems which enable fast response and timely notification of forest fires are primarily financially better due to lesser cost, provide faster detection and fast notification no matter of time of the day and weather conditions enabling faster organization, faster arrival of firefighting units and increased efficiency of the extinguishing. This manner of fire monitoring enables faster response in initial phase of the fire, need for lesser number of personnel and need for smaller amount of extinguishing equipment. Linking these integral systems for detection of forest fires with index of threat of occurrence of forest fires and geographic information systems which support the sector of forest fires, great possibilities open up in preventive and organizational protection of forests from fires. Map 27 as proposed by Author, shows layout of locations for installation of cameras and visibility zone, according to different distance levels.

## 6. WEATHER CONDITIONS, DANGERS AND POTENTIAL EMERGENCY SITUATIONS RELATED TO TRAFIC

Municipality Zagubica covers the territory of 762 square kilometer and is characterized by highly unstable weather conditions, especially during the winter months, with extremely high percentage of snowfall, strong winds, low temperatures which in some periods fall to -15 degrees. These weather conditions particularly negatively reflect on the functioning of the traffic at local roads, i.e. to the settlements and in the streets within the settlements in municipality of Zagubica. Road maintenance at the local level is complex and requires optimal engagement in order for the traffic to be carried out smoothly and without interruptions. In order to achieve rationality in maintenance of local roads and streets during the winter period, cooperation of all participants in traffic, companies that main

tain the roads, traffic police, all local communities and citizens at the territory of municipality Zagubica is necessary, as well as information on the state of the roads and conditions prevailing at travel routes at the territory of the municipality Zagubica. It is a well-known fact that Eastern Serbia abounds in heavy rainfalls, low temperatures, large number of days with ice rain, snow and snowdrifts. Taking into account the indented territory of the municipality Zagubica, cleaning and maintenance of the roads is extremely difficult and requires great effort.

Having in mind the overall situation based on analysis and expressed needs, and with objective to decrease the risk of possible emergency situations in traffic sector and winter maintenance of the local roads and streets in settlements in municipality Zagubica, the following measures and activities are proposed:

1. Developing and adopting the yearly plan of winter maintenance of local roads and streets in municipality Zagubica
2. Ensuring necessary quantities of stone grit and industrial salt for spreading at the roads
3. Compile the list of potential risk locations and ensure emergency cleaning of roads
4. In case of extreme precipitation, engage mechanization of local companies
5. Ensure preconditions for purchase of 1 vehicle with coulters which would clean and maintain roads during the winter months
6. Increase level of information of citizens through regular reporting the state of the roads via local media
7. Enhance cooperation with local companies

## 7. RISK MANAGEMENT IN PROTECTION OF FORESTS FROM FLOODS

Area of municipality Zagubica is hilly-mountainous, intersected with recesses and valleys. At the territory of municipality (settlement Zagubica) springs the river Mlava and flows through larger part of the territory, than through Gornjak gorge crosses to territory of municipality Petrovac na Mlavi.

Flood protection is performed in line with Law on waters (Official Gazette of RS, no. 30/10, 93/12 and 101/16), Law on emergency situations (Official Gazette of RS, no. 98/2010), General flood protection plan (Bylaw on determining general flood protection plan for the period 2012-2018, published in Official Gazette of RS, no. 23/2012), Yearly operational flood protection plan for the waters of the I rank – republic operational plan – (Order on determining operational flood protection plan published in Official Gazette of RS, no. 5/2017 dated 25<sup>th</sup> January 2017, enacted on 2<sup>nd</sup> February 2017), and operational flood protection plans for the waters of the II rank (local operational plans).

Territory of municipality Zagubica in its largest part overlaps with the basin of the river Mlava and its confluents in its upper part of the flow, from the spring (Spring of Mlava) to its exit from Gornjak gorge, Exception is a smaller part of the territory of municipality Zagubica, which is mainly made of agricultural and forest land, without active settlements, which belongs to basin of the river Pek.

Considering distinctly torrential character of all waterways and indivisibility of the territory which belongs to the same basin, flood protection at the territory of municipality Zagubica must present integral process closely linked to the flood protection of the protected cassette, implemented by the Public Water Company Srbijavode.

### Hydrographic characteristics of the area

Dominant waterway at the territory of municipality Zagubica is the river Mlava with its confluents.

Territory of the municipality Zagubica gravitates to main waterway – river Mlava which spring in the very settlement of Zagubica (Mlava Spring). At the stretch through municipality (to exit from Gornjak gorge), at the flow 45,83 km long, with the related surface of the basin of approx. 700 km<sup>2</sup>, exist the following confluents:

**Right confluents:** Tisnica (formed by Mala Tisnica and Crna river), stream Zabar, Kamenicka river, Velika river (made of Milatovacka river, Crna river and Valja Mori), Vukovacka river, Josanicka river, Adujevski stream, Osanicka river (with confluent Carinski stream), Krepoljinska river with confluent Truc and Breznicka river.

**Left confluents:** river Do, Krupajska river, Bliznacka (Medvedjicka) river and Dubocica.

To perceive the level of threat from damaging effects of waters for this area, of special significance is the knowledge of:

- natural characteristics of the area,
- hydrological characteristics of dominant water-ways and confluents, with data on built protective systems and disposition of potentially threatened objects in relation to water-ways,
- having insight in problem of protection of natural resources located at the coast of regulated and unregulated water-ways.
-

**Criteria for declaring flood protection**

Usual approach to protection from high waters at larger rivers with introduction of levels of regular and emergency protection is not possible to observe at waterways with torrential hydrological – hydraulic regime. Declaring criteria may be only hydrological and meteorological prognosis of applicable rain in relation to degree of saturation of land and expected (prognosticated) water-level of rivers.

Criteria for declaration of emergency situation during torrential floods is when the level of water in the river bed exceeds the height of the coast crown and spills out into the coastal zone.

During most of the torrential floods at the territory of municipality Zagubica, up till now no active measures of protection have been undertaken, but only the consequences of the floods were passively remediated.

**Threat level of the area**

In the coastal zone of torrential and unregulated waterways, i.e. basins of regulated and unregulated areas without clearly differentiated flow, choice of criteria for declaring the protection phase is within exclusive authority of the municipality Zagubica.

Securing and preserving the free circulating profile in torrential unrounded protective cassettes (objects for directing the flood wave into the cunette) is of particular significance.

Table 27. Criteria for delivery of works

<b>CRITERIA</b>		
For preparation of delivery of works, measures and activities during flood protection and declaring phases of flood protection within the authority		
<b>Phases of flood protection</b>	<b>Criteria for declaring phases of flood protection</b>	<b>Rank and type of activities, measures and works by phases of flood protection</b>
PHASE 1 Declaring state of preparedness	<i>Preparation of protection and announcement of flooding rain</i> -heavy downpour rains – rains of strong intensity at applicable part of the basin flow <i>or</i> Declaring regular flood protection at protected cassette	Preventive activities, measures and works in preparatory period for preventive removal of potential causes of flooding and organization of flooding protection
PHASE 2 Declaring emergency situation	<i>Announcement and occurrence of spill out of flooding wave</i> from basic flow in circumstances of continuous rainfall in the basin and occasional heavy downpour rains at the applicable part of the basin <i>or</i> declaring emergency flood protection at protected cassette	Emergency activities, measures and works in implementing flooding protection

**Flood threats**

Characteristic for municipality Zagubica is the fact that a flood occurs each 3-5 years, flooding 300-500 ha of arable land.

Part of the estimate related to hydrological characteristics of the municipality, took into consideration characteristics of all waterways at the territory of municipality Zagubica which brought to conclusion that all rivers and streams, due to characteristics of the relief, are of distinctively torrential character. This characteristic of the waterways is especially expressed during the spring period, melting of the snow, as well as during more frequent and abundant rains.

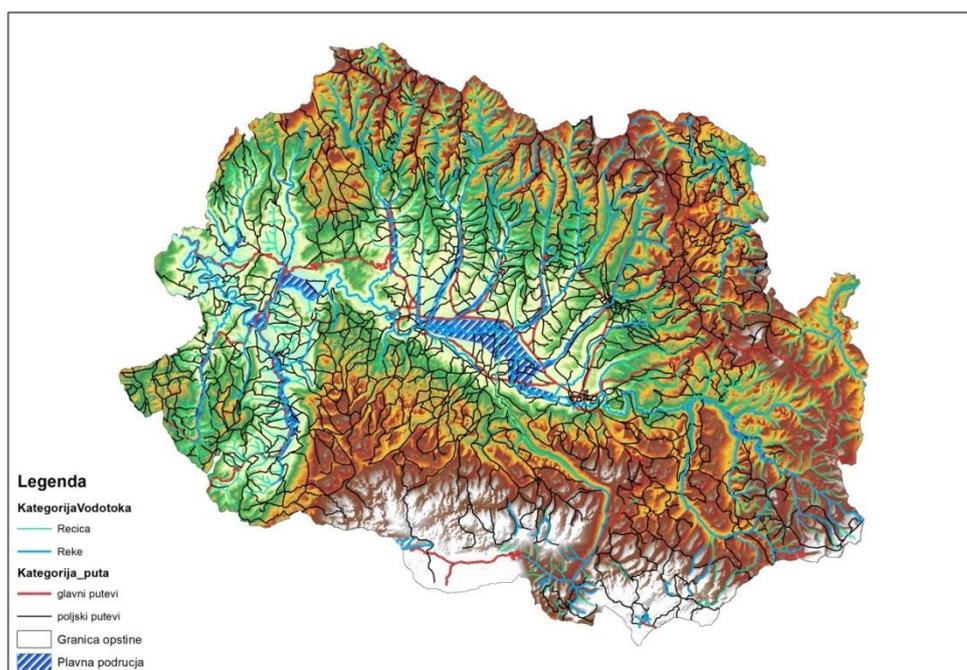
**Preventive measures of flood protection**

At the territory of the municipality a series of preventive measures may be undertaken, with objective to prevent floods in potentially threatened areas or the undertaking of preventive measures may significantly reduce the negative effects of the floods.

Basic preventive measure of flood protection related to **spatial and urban planning**, which does not envision construction of expansion of the settlement at the locations that might be threatened by flood or high level of underground waters.

The following preventive measures would refer to:

- correcting waterways,
- cleaning of the river beds and the coast of vegetation,
- cleaning of the river beds and the coast of large waste and litter,
- cleaning the waterways of deposits and mud,
- removing illegal landfills from the coasts,
- rehabilitation of the approaches to the bridges; rehabilitation of pillars and stone coating of the bridges,
- rehabilitation of the inclination of embankment by stone coating or grass, etc.



**Map 28.** Map of threat of floods with road infrastructure

## Role of local communities in risk management during the floods

Preventive acting:

1. Development of the local level flood protection plan and its expert consideration
2. Considering all dangers and determining particular threatened parts and settlements
3. Planning and construction of the protection measures such are embankments, dams, canals, wastewater system and other
4. Developing model of waves expansion in particularly threatened areas
5. Purchase of equipment for local level flood protection
6. Training of men for flood protection
7. Monitoring threats and hydrological situation at any moment and reacting to all meteorological alarms
8. Develop a plan of possible evacuation and removing population as well as animals
9. Develop a plan of alternative water supply

Response when event occurs:

1. Rapidly consider situation and make appropriate conclusions, recommendations and orders
2. Declare emergency situation or event depending on scope and threat
3. Continuous meeting of Emergency situations headquarters
4. Engaging all human resources and equipment for response to risk
5. Continuous notification of threat and measure that are being undertaken
6. Perform timely evacuation and rescue of people, animals and material goods

## JOINT STUDY EMERGENCY SITUATIONS RECAS-ZAGUBICA

7. Provide reception centers for the affected persons
8. Include and coordinate the work of all bodies and institutions through Emergency situation headquarters
9. Provide logistical assistance (food, clothes, shoes, medicines and similar)

Role of the local self-government after the unwanted event – flood:

1. Continuous meetings of the Emergency situation headquarters and coordination of work of all structures
2. Considering state after the flood and joint participation together with the professional services
3. Damage evaluation and provision of assistance to affected population
4. Pumping of water from facilities and surfaces. Cleaning and disinfection
5. Development of plans for repairing the damages and assistance to affected population with professional services
6. Removing and treatment of dead animals by authorized services
7. Drying interiors after the floods
8. Logistical assistance in food, water, medicines, clothes and other
9. Medical assistance to affected population
10. Media notification on all important factors and facts

### 8. ESTIMATE OF THE DAMAGES CAUSED BY NATURAL DISASTERS – FLOODS THAT AFFECTED PART OF TERRITORY OF THE MUNICIPALITY ZAGUBICA 14.-15.06. AND 02.08.2018.

Settlements Bliznak, Medvedjica, Krupaja, Milanovac and Sige, i.e. south-eastern part of the territory of municipality Zagubica, has been affected by heavy precipitation during a short period, in the night of 14/15 June 2018. According to estimates, in the night of 14 June 2018 from around 10.30 p.m. to morning hours of 15 June 2018, in this part of territory of Zagubica more than 50 l/m<sup>2</sup> of rain has fallen. This cloud front caught broader territory of Serbia, in particular municipalities Petrovac na Mlavi and Svilajnac, causing as well great damages, especially in the municipality Petrovac na Mlavi.

Abovementioned heavy rains initiated occurrence of the torrential flood waves, the water was coming down from the surrounding hills, carrying mud and deposits, and concentrating in two waterways – Bliznacka (Medvedjicka) and Krupajska rivers, causing significant rise in water levels and flow, and the greatest damages in their coastal zone, especially in basin of the river Medvedjicka.

Emergency situations headquarters of municipality Zagubica had declared a natural disaster at the part of the territory on 15 June 2018, by Decision no. IV-01-87-957/18 and by Resolution no. IV - 01-02-958/18 dated 15 June 2018 appointed the Commission for estimation of damages caused by natural disaster. Commission was instructed to make an assessment visit and compile a report on occurred damages.

The damage, occurred as a result of devastating effects of the torrential flows, may be classified to:

- A. Damages on public infrastructure and communal objects,
- B. Damage on arable land,
- C. Damage on facilities and surfaces nearby privately-owned objects

#### **A) The following public infrastructure and communal objects were damaged:**

- Public and uncategorized roads and streets in settlements, and related road objects (supporting walls, tubular ducts and similar),
- River beds of waterways,
- Water supply installations, postal installations.

1. Damages that have occurred at public roads and road objects, namely:

- **Damages at local (municipal) road Krepoljin-Medvedjica-Bliznak total length of 12 km.**

This road has been most severely damaged, especially at the section between the settlements of Medvedjica and Bliznak long approx. 3 km, where in large part the existing asphalt roadway 3.5 m wide was damaged.

The damages occurred at the locations where mountain streams cross the mentioned road, by throwing out deposits, stones and mud, eroding the slope cuttings, burying ducts and other.

Concrete and stone supporting walls in the river gorge whose precise purpose was to protect the road from eroding effects of the river flow, of 250 m total length, 3 m high on average and thick about 50 cm, were also damaged or completely destroyed. It is necessary to note that for reconstruction of damages at roads and river bed it is

mandatory to plan the reconstruction of damaged walls as well as construction of new walls to ensure complete protection in the future.

- **Damages at local (municipal) road Bliznak Donja mala - Bliznak Gornja mala - State road 2A class, no. 186**

This road of total length approx. 4.2 km whole roadway is constructed in the largest part of gravel, suffered damages of roadway construction – washing away of existing gravel tampon at the largest part of the section, and in particular between Gornje and Donje male in total length of approx. 900. At that section, the roadway gravel cover has been completely washed away, curbs destroyed and significant amount of the deposit and mud from surrounding land has built up on the roadway.

- **Damages at the State road 2A class, no. 186**

At section of the named road from the settlement Sige, via settlement Milanovac and Krupaja, all the way to the end of the territory Zagubica, deposits, mud and clay from surrounding access and uncategorized roads and torrential streams occurred.

- **Damages at the uncategorized roads and particular streets at the territory of named settlements**

Roads in endangered area mostly have longitudinal decline and occurrence of the larger quantities of the surface waters caused washing away and carrying off of the final roadway cover, occurrence of the deposits, mud and stones, occurrence of landslides and rock slides, burrying of road ditches and similar. Roads and streets at the territory of the settlements Milanovac and Krupaja, positioned in direction West-East were especially affected.

#### 2. Damages that have occurred at the river bed of the Bliznacke (Medvedjicke) river:

At the location between settlements Bliznak and Medvedjica and through the Medvedjica itself, significant damaging of the existing river bed occurred, causing the deepening and widening of its flow, at some sections the complete change of originally steady flow, river coast, road and surrounding agricultural land were undermined and carried away, vegetation and occasional trees from the coast and surrounding terrain were pulled out.

#### 3. Damages that have occurred at the water supply and postal installations

At previously described section where named installations are positioned in parallel or cross the municipal road and river bed, ditches were dug up, cables were bared and disruptions (breaking) occurred at multiple locations at the section 1.5 km long.

### **B) Damages at agricultural land:**

At flooded parts of agricultural land, crops were laid down or completely destroyed, deposits and sturdy stones were taken out, part of the parcels along the river flow eroded, flooding and retention of the surface water occurred, which resulted in destruction of part of the harvest, but also in degradation of the agricultural land. It is estimated that approx. 45 ha were damaged.

### **C) Damages on facilities and surfaces nearby, possessions and other private ownership:**

These damages were also a result of torrential acting of waterways, primarily of Medvedjicka river, where destruction of part of the fences and concrete walls occurred, as well as of parts of the yards, lawns, auxiliary facilities, some items were carried away, even the agricultural equipment such are harrows, splitters and similar.

### **Flood in Zagubica 02 August 2018**

During the night of 1 and 2 August, at the territory of Zagubica and at Crni vrh mountain, 100-130 l/m<sup>2</sup> of rain fell. Torrential river Tisnica rose in the morning around 10 a.m. causing flooding, without casualties.

## **JOINT STUDY EMERGENCY SITUATIONS RECAS-ZAGUBICA**

Emergency situation was declared in 8 settlements of the municipality Zagubica: Milatovac, Suvi Do, Izvarica, Ribare, Josanica, Vukovac and Krepoljin. Approx. 600 households were flooded, of which approx. 220 households` residential objects were damaged, while 380 households suffered damages only at auxiliary objects.

20 persons were evacuated into the balloon hall (6 men, 7 women and 7 underage children), who are still situated there. That location was otherwise used as a collective center for welfare beneficiaries.

Approx. 10 km of the road along the gorge of the rive Tisnica and approx. 2 km in the settlement of Zagubica was destroyed. Damaged were 6 bridges, approx. 60 greenhouses, while fishpond in Zagubica as well as 70 beehives and bee societies were destroyed.



**STUDY WITH ASSESMENT OF THE TERRAINE AND ECO-SYSTEM FROM THE ASPECT OF INFLUENCE TO BREAKING AND SPREADING OF THE FIRES, AND ANALYSIS OF THE CHARACTERISTICS OF THE AREA IN THE FUNCTION OF PREVENTION AND ADEQUATE FIRE PROTECTION WITH PROPOSAL OF MEASURES FOR LOCAL COMMUNITY AND POPULATION**

**BENEFICIARY: RECAS MUNICIPALITY, TIMIS COUNTY (ROMANIA)**

## Introduction:

### **The purpose of the project.**

The general objective of the project is: To identify risks likely to result from fires and natural disasters in the area of the Recas town and subordinated villages, as well as reduce impact in case of such disasters, by increasing awareness of environmental and fire risks, acting on basis of a precise strategy and using efficient equipment, that will improve both the reaction and the result of the intervention of specialized forces for emergency situations.

The project implementation will reduce the uncontrolled negative impact of natural disasters on the town of Recas and will efficiently and securely increase environment protection.

The final results of the study are:

- a) a clear mapping of risk areas around the town of Recas and the subordinated villages;
- b) the elaboration of procedures used in emergency situations caused by natural disasters likely to occur in the town of Recas and subordinated villages, determined by the need to protect population and its goods, as well as the need for a proper management of intervention activities prior to, during and after the occurrence of such phenomena;
- c) the submission of a strategy on the management of fire and natural disaster risk, including a range of actions at the level of the entire administrative and territorial units regarding the education of population in risk areas, the development and training, through protection plans, of the Volunteer Service for Emergency Situations of the town, alerting, warning and informing population, the funding of such measures and of the rehabilitation of affected areas.

### **The Legal Framework on the Management of Emergency Situations.**

The main normative acts regulating the management of emergency situations that may occur on the Romanian territory are as follows:

1. Law no. 307/2006 on fire protection, as subsequently amended and supplemented;
2. Emergency Ordinance no. 21/2004 on the National System for the Management of Emergency Situations, approved with supplementations and amendments by Law no. 15/2005;
3. Law no. 107/1996 on waters, as subsequently amended and supplemented;
4. Law no. 481/2004 on civil protection;
5. Order of the Ministry of Internal Affairs no. 163/2007 on the General Guidelines for fire prevention;
6. Government Decision no. 2288/2004 on the approval of the assignment of the primary supporting functions of ministries, other central bodies and non-governmental organizations regarding the prevention and management of emergency situations;
7. Government Decision no. 1489/2004 on the organisation and operation of the National Committee for Emergency Situations;
8. Government Decision no. 1491/2004 on the approval of the Master Regulation on the organizational structure, attributions, operations and equipment of operative centres for emergency situations;
9. Joint Order no. 638/420/2005 of the Minister of Administration and Internal Affairs and the Minister of Environment and Water Management on the approval of the Regulation on the management of emergency situations generated by floods, hazardous weather phenomena, accidents in hydro-technical constructions and accidental pollutions.
10. Order of the Ministry of Internal Affairs no. 96/2016 on the approval of Performance Criteria for the establishment, recruitment and equipment of Volunteer services and private services for emergency situations.

## Chapter I

**Assessment of the land and ecosystem from the perspective of the influence of fire occurrence and spreading and analysis of local characteristics in accordance with suitable prevention and protection against fires and other natural disasters, with proposed measures for the local community and the population of Recas and subordinated villages**

**A. Geographical and economic references on the town of Recas and subordinated villages**



Map with the geographical position of the town of Recas, Timis county, <sup>1</sup>.

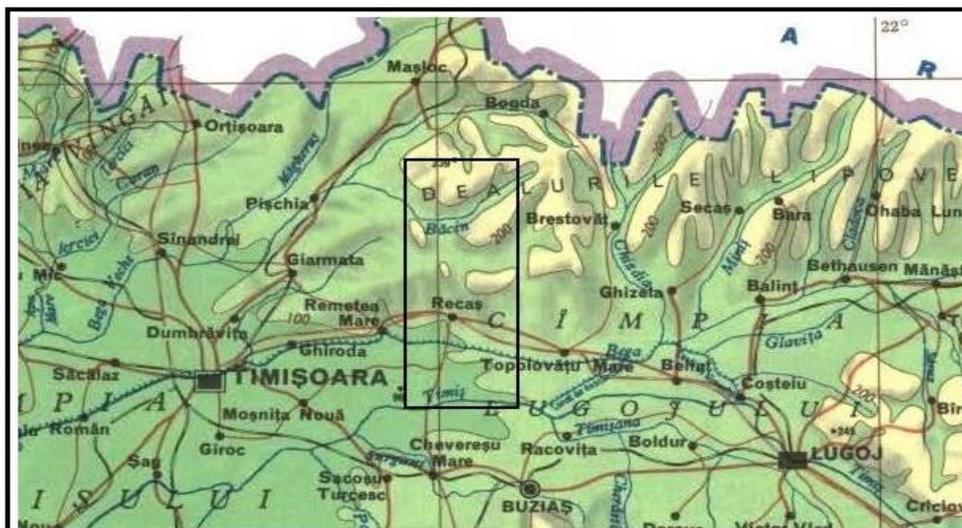
The town of Recas is included in the Timis county and is located in its central area, 19 km from Timisoara (the county capital) and 37 km from Lugoj, on the national road DN6 (E70) and the highway A1, which crosses the administrative territory of the town from east to west. The administrative unit has an area of 22,988.21 ha, and the stable population included 9439 inhabitants in 2014.<sup>2)</sup>

It includes the town of Recas and 7 other settlements: Izvin, Bazos, Herneacova, Petrovaselo, Stanciova and Nadas.

The Recas administrative-territorial unit is located in the centre-north of the county and neighbours the administrative territories of Bogda to the north, Cheveresu Mare and Racovita to the south, Topolovatu Mare and Brestovat to the east, Remetea Mare and Pischia to the west.

1. The Risk Analysis and Coverage Plan (PAAR) of Timis county, p.1.  
2. National Statistics Institute. Romania's population by settlements, as of 01.01.2016, p. 125.

**Prevalent types of land:**



Map with the types of land of Recas - excerpt.

**Source:** Physical map of Timis county.

## JOINT STUDY EMERGENCY SITUATIONS RECAS-ZAGUBICA

The town of Recas is located in the south of the Lipova Hills, to an extent of 45%.

Intra-hill valleys (lowlands) have width ranging from some dozens metres to 450 m, helping evacuate waters during periods of significant precipitations and until the snow melts.

The highest part of the under-hill plain ensures the transition from piedmont hills to the low plains, with the following sections:

The under-hill plain (Recas-Petrovaselo), a part of the south-west margin of the Vinga Plain, with a height ranging from 180 to 135 m;

The terrace plain (Recas-Izvin), a last southern branch of the Vinga Plain, supported on the shore of Bega and the Low Timis Plain, with the aspect of a wide plateau, with a height ranging from 160 to 100 m.

The low plain (80 m - 100 m), located to the south of the territory, with land characterized by a wide development of the lowlands of main rivers, with many meanders, branches and abandoned courses, representing a part of the Timis Plain, includes two divisions:

- the low plain between Bega (channel) - and Timis;
- the low plain to the north of the Bega channel.

The agricultural land of 19,558 ha is used for the following purposes:

- arable land = 12,121 ha,
- pastures and fodder = 5,611 ha;
- vineyards and orchards = 1,810 ha.

Non-agricultural land is classified as follows:

- forests = 1,810 ha;
- waters and marshes = 403 ha;
- roads = 510 ha;
- incorporated land (buildings) = 467 ha;
- non-productive land = 450 ha.

### The water network



Map with the water network of the town of Recas - excerpt

**Source:**The Risk Analysis and Coverage Plan (PAAR) of Timis county.Page291.

From a hydrographic point of view, the area is located in the Timis-Bega basin.

The most important water courses are the rivers Timis and Bega and the streams Bacin (Suma), Lipari, Valea Tiganului, Gherteamos (Lunga), Barcas, Iarcos and Curasita.

The Timis river is located to the south border of the studied area, with the Bazos village being the closest settlement.

The Bega channel is located 3 km away from Recas to the south and to the north of Bazos.

Two systems of drainage channels are established in the territory of Recas:

- the Recas-Chizatau system to the north of Bega, including the area of the settlements of Recas, Izvin and Petrovaselo.
- the Sag-Topolovat system to the south of Bega, including Bazos.

The north area of the administrative unit, i.e. the area of Nadas, Herneacova, Stanciova, does not have a drainage system.

Natural vegetation is specific to plain and hill forests.

Wooden vegetation covers about 8% of the land.

Depending on its structure, this includes the mixed forest of Bazos and the Turkey oak and Hungarian oak forests of Stanciova – Herneacova - Nadas.

### **Vegetation and fauna.**

Natural vegetation is specific to plain and hill forests.

Wooden vegetation covers about 8% of the land.

Depending on its structure, this includes the mixed forest of Bazos and the Turkey oak and Hungarian oak forests of Stanciova – Herneacova - Nadas.

### **Climate**

The climate is temperate-continental with a slight Mediterranean influence, and winters are generally mild, summers are warm, autumns are long, and transitions from winter to summer are quite sudden.

#### Reference data:

Short and mild winter, with an average temperature of 0.2°C;

Early and warm springs, with frost in April, average: 10.9°C;

Long and warm summers, with an average temperature of 21°C;

Long autumns with constant temperatures, with an average of 11°C.

#### The analysis of precipitations is as follows:

- rain peaks are found in May-June and October-November;

- the annual average of precipitations is 600 mL/sqm.

#### Main wind directions and speed:

- North-South, about 16% on an annual basis;

- East-West, about 13% on an annual basis.

The average wind speed is 2-3 m/s, higher in March, April and December and lower in June-August and September-October.

### **Roads and railways crossing Recas.**

#### **Road communication:**

The A1 highway Bucharest-Timisoara-Arad passes to the north of Recas, with an exit between Izvin and Remetea Mare;

The national road DN-6 (E70) Bucharest-Timisoara crosses Recas and Izvin from the east to the west, with 2 lands;

#### Commune-level roads:

- DC 65 Recas - Izvin, 4 km, damaged, off-road;

- DC 66 Recas - Stanciova, 14 km, asphalt;

- DC 67 Stanciova - border of the administrative area, damaged, off-road;

- DC 68 Herneacova-Nadas, 7 km, stone;

- DC 69, from DC 67 to the border, damaged, off-road;

- DC 71, Nadas - border of the area, stone;

- DC 75 Recas - Petrovaselo, 10 km, asphalt;

- DC 147 Recas - Bazos 9 km, asphalt;

- DC 148 Bazos - Bazosu Nou, damaged, off-road.

#### **Railway communication.**

The 900 railway line, Bucharest-Timisoara, electric line, with railway stations in Recas and Izvin.

### **Position compared to the main tectonic faults.**

From a seismic point of view, the area of Banat is the second seismic area in terms of both number of events and released energy.

The earthquakes occurring in the county have a range of specific features:

- low depths of hotbeds, from 5 to 15 km;
- the areas of epicentral areas, with maximum effects, are very small;
- the shapes of isoseists are slightly elliptic to circular;
- a quite low number of pre-shocks, followed by a very high number of replicas or aftershocks;
- the main delimited faults have different orientations and depths;
- the hotbeds of the main earthquakes in the county are located at the intersection or close to the intersection between geological faults of different ages.

### **Water supply of the settlements of the town of Recas.**

Recas has a central water supply system, supplied from wells drilled at a depth of 90-120 m.

### **Environmentally protected areas.**

The territorial area of Recas does not include environmentally protected areas, as defined by the legislation in force.

However, according to the Land Planning of the Timis county, environment-tourism section, 2011 edition, updated, 3<sup>rd</sup> volume, the territory of the town includes the following:

- The Lunca Timisului community importance site, code ROSCI0109, of the continental-pannonic biogeographical area, in the area of Bazos, included in Natura 2000 sites, as a habitat with Ranunculion fluitantis vegetation, i.e. one of the 24 communities of water plants (A18) included in the national classification of water plants.
- The Recas forest, with an area of 280 ha, with old trees, located between Recas and Bazos.

## **B. Identification of natural risks likely to occur in the area of Recas.**

### **1. Fires.**



Intervention of SVSU Recas in the vegetation fire - 2018.

Source: Images from SVSU Recas.

#### **a) Forest fires.**

Forest fires are non-controlled fire, in an area of naturally combustible vegetation. They may be caused by several factors, either natural or human.

Examples of human causes:

- pyromania
- glass pieces acting like a magnifying glass and reflecting sun rays against the dry (dead) vegetation.\*

Forest fires may be:

- forest border fires;
- tree crown fires;
- fires under the leaves;
- fires in an area with trees that are down on the ground.

1809 ha of forest exist on the territory of the town of Recas and the Stanciova, Herneacova, Nadas and Bazos villages.

The forsts are included in the following Forestry Units: Timisoara, Lunca Timisului and the “Ocolul Silvic Stejarul” R.A. Local Public Company of Recas.

Forest fire risk is high at the beginning and end of the vegetation period (March-April in spring and September-October in autumn), as well as during periods of long drought.

The causes of forest fires may be:

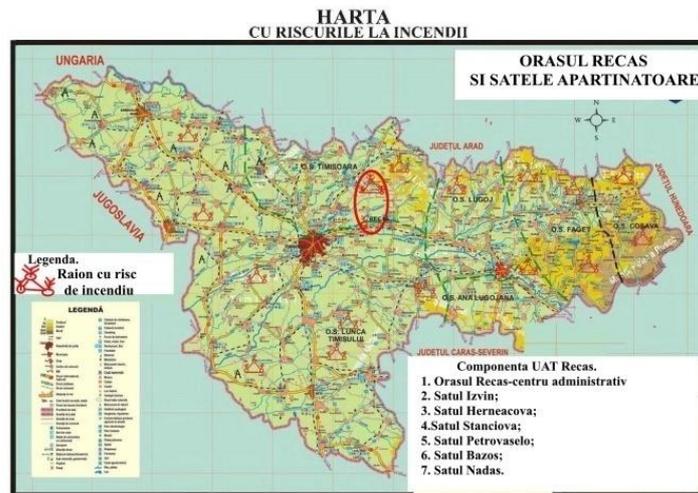
- Negligent use of fire to prepare food or for heating;
- Cigarettes thrown away randomly;
- Burning wooden remains resulting from wood operation;
- Creation of agricultural areas by burning or improving pastures;
- Thunder.

Premeditated arsons.

According to the estimates of relevant institutions, forests near Stanciova, Herneacova and Nadas are included in the high fire risk forest category.

Consequently, the population and goods from these villages may be affected by fires occurring in forest areas and nearby.

The capable population has to be prepared to take part in limiting the propagation of fire to personal residences, cultures, farms, etc.



Map with fire risk areas in the Timis county

**Source:** the Risk Analysis and Coverage Plan (PAAR) of Timis county, p. 300.



Map of forest fire risk

in the north of Recasin the south of Recas

Map of forest fire risk

**Source:** Google Maps.

**b) Dry vegetation fires**



Vegetation fires occurring in Recas in 2018.  
Source: Images from SVSU Recas.

Dry vegetation fire risk is high during summer, at the beginning and end of the vegetation periods (March-April in spring and August-October in autumn), since high temperatures enhance dryness.

Moreover, periods of extended drought are a significant preparatory factor for vegetation fires.

Electrical discharges are the most frequent triggering factor of vegetation fires, and intense wind plays a major part in fire propagation and intensification, as fire speed is directly related to wind speed.

This kind of fire occurred on the territory of Recas, Nadas, Herneacova and Stanciova.

**c) Fires of cereal crops**

The risk of cereal crop fire is high during summer, in the ripening and harvesting period for such cereals, as well as during periods of long drought.

Such fires occurred on the territories of Recas, Izvin, Bazos and Petrovaselo.



Protection of personal residences  
after a fire in cereal crops in the area of the town of Recas in 2018.  
Source: Images from SVSU Recas.

**d) Fires in an area with trees that are down on the ground.**

The forests on the territory of Recas and neighbouring villages were affected by the storms and tempests that took place in the last years, resulting in a large number of trees falling down, which were not taken out of the forest.

A lot of the forests are old, with trees fallen down.

The risk of fires caused by trees fallen down is given by forest border fires or by fires under the leaves.

**e) In personal residences**

Residences are mostly heated with solid fuel, in stoves with or without heat accumulation. Smoke is evacuated from the stoves by means of chimneys that pass through or near the combustible elements of the roofs or with non-insulated metal spouts.

Food for animals is heated in furnaces that are not closed, inside household enclosures.

This fire was prevalent in the town of Recas and villages such as Izvin, Bazos, Petrovaselo, Nadas, Herneacova and Stanciova.



Ignition of a beam in the bridge of a house Recaş because of a chimney

Source: Images from SVSU Recas.

**f) In companies**

Companies with a high and average risk of fire, either due to production or storage processes, or by holding and marketing flammable substances (gas, diesel, oils, paints, liquefied petroleum gas).

The main companies in the area are: the fuel distribution station of Recas, Cramele Recas SA, Sodacma SRL, Herghelia Izvin, Domeniul Herneacova SA.Etc.

**2. Hazardous weather events**



Effects caused by the violent storm of Recas - September 2017.

Source: Images from SVSU Recas.



#### **d) Tornadoes.**

Tornadoes are violent atmospheric disorders, of a small dimension and a turbionary nature, under the aspect of a narrow column that rotates very quickly or a reversed funnel that reaches the soil.

They are frequent at the end of spring and beginning of summer.

They occur when warm and cold air currents crash and a rotation area is created, with low atmospheric pressure.

Effects are extremely serious both on people and on the community, due to wind speed, dust and the objects taken up by the tornado and thrown back.

This weather event may occur in Recas and the subordinated villages of Izvin, Bazos, Petrovaselo, Nadas, Herneacova and Stanciova.

#### **e) Drought**

Drought is a natural phenomenon that occurs when precipitations are lower than usually, resulting in de-regulations of the hydrological balance and negatively influencing the productive systems of land resources.

Drought appears when average annual precipitations are lower than average, and their distribution is not synchronized with the vegetation phases of crops.

By drought we understand a period of 10 days without precipitations in April-September or 14 days without precipitations in October-March.

The effects of drought may be:

- reduced agricultural production;
- lower quality and amount of drinking water;
- reduced amount of food supplied for both people and animals;

increased fire risk in dry crops and personal households;

increased risk of diseases in the population, due to a lower nutritional state;

This weather event may occur in Recas and the subordinated villages of Izvin, Bazos, Petrovaselo, Nadas, Herneacova and Stanciova.

#### **f) Hailstone**

Hailstone is a form of precipitations where water particles in the atmosphere fall on the soil under the shape of ice.

It occurs when rain drops cross air layers with low temperatures (less than 0 °C).

Ice particles generally have an irregular form, with an average diameter of 5-50 mm, but it can be higher in the case of thunderstorms.

Hailstone occurs primarily in the warm season, being associated to strong winds, rain and electrical discharges.

Effects of hailstone:

- it may cause major harm to agricultural crops;
- it may damage the roofs of buildings or motor vehicles;
- it may cause wounds or the death of animals on fields and shelterless persons.

This weather event may occur in the town of Recas and the subordinated villages of Izvin, Bazos, Petrovaselo, Nadas, Herneacova and Stanciova.

#### **g) Frost, ice bridges and dams, massive snowfalls, ice**

Freezing and massive snowfalls may occur during winter, especially in the hilly part of the area.

Frost may affect power lines and air communication, which may even break.

The ice formed both in winter and spring may cause harm to persons and road accidents.

This weather event may occur in the town of Recas and the subordinated villages of Izvin, Bazos, Petrovaselo, Nadas, Herneacova and Stanciova.

3.Destructive geological phenomena.

a) Landslides



Areas with landslides in Stanciova and Nadaş  
Source: Recaş City Hall

Landslides are hard to locate both on a macro and micro level.

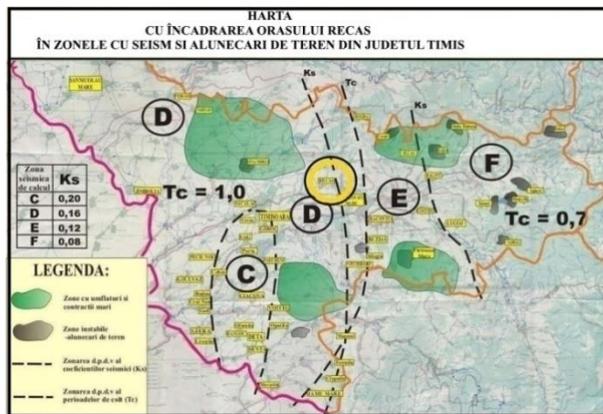
According to the study of PATJ Timis “Study for the substantiation of risk areas”, page 98, the town of Recas has the potential of low-average landslides, of a reactivated type, on an area of about 800 ha, of which:

- Very strong and excessive superficial erosion = 200 ha;
- Active slides, falls, cave-ins, leakages = 200 ha.

The targeted areas are the ones within the Stanciova, Herneacova, Nadas villages.

The effects of landslides affect:

- The population, as well as its mobile or immovable goods;
- Buildings:(residential buildings, buildings for education and social-cultural buildings);
- Ways of transport;
- Power and gas supply networks, as well as water supply and sewerage;
- the natural environment;
- social and economic activities.



Map with the classification of Recas in earthquake and landslide risk areas

Source: Land planning of the Timis county. The Timis County Council P. 136.

## **b) Earthquakes**



Consequences of earthquakes in urban areas.

Source:Google - earthquake images.

The spatial distribution of the epicentres of earthquakes in the area shows a quite high number of areas with a high seismic risk, as follows:

- *areas with earthquakes with an epicentre intensity of 8° Mercalli:*Banloc-Ofsenița; Voiteg ; Șag - Parța; Vinga - Variaș

- *areas with earthquakes with an intensity of 7° Mercalli:*Periam, Sânnicolau Mare, Sânmihaiu Român, Jimbolia and at the border with Serbia; Timișoara, Săcălaz, Peciu Nou, Ciacova, Recaş and Buziaș.

8 main seismic faults are defined:Timișoara Vest; Săcălaz-Sânmihaiu Român; Banloc-Liebling-Buziaș; Voiteg-Peciu Nou-Cărpiniș; Vinga-Variaș; Becicherecu Mic-Mașloc; Sacoșu Mare-Arad and Buziaș-Recaș-Vinga, where the administrative-territorial unit of Recas is found.

The area of Recas is exposed to a seismic hazard of at least VII in MSK (Mercalli) degrees.

Earthquakes of 7 MERCALLI degrees have occurred.

The settlements of Recaş, Bazoș, Izvin, Stanciova, Petrovaselo and Nadas are located on the Buziaș-Recaș-Vinga seismic fault.

## **Chapter II**

### **Drawing up the procedures used in case of natural disaster and after intervention for cleaning affected locations in the project area - Recas and neighbouring villages - Izvin, Bazoș, Stanciova, Herneacova, Petrovaselo, Nadaș**

The purpose of the elaboration of procedures used in emergency situations caused by natural disasters likely to occur in the town of Recas and subordinated villages is determined by the need to protect population and its goods, as well as the need for a proper management of intervention activities prior to, during and after the occurrence of such phenomena;

The used procedures consist of:

- Establishing a unitary set of guidelines for the regulation of activities performed by the mayor of Recas and by the Operative Centre for Emergency Situations, before, during and after the occurrence of emergency situations generated by fires, floods, hazardous weather events or destructive geological phenomena;

- Establishing the intervention of the Volunteer Service for Emergency Situations of Recas, as well as the components of the County System for Emergency Situations, in case of emergency situations generated by natural disasters.

#### **A. Procedures used in case of forest fires.**

The procedure is applied in case of emergency situations generated by fires, irrespective of their scope, so as to maintain and emphasize a climate of normality, to ensure prevention and limit consequences.

### a.1 The prevention phase in vulnerable periods.

Drawing up or updating the Risk Analysis and Coverage Plan.
The decision to approve the risk coverage plan of Recas.
Establishing specific rules and measures correlated with the level and nature of risks.
Ensuring the training of staff, of the Service for Emergency Situations and of citizens in terms of observing the guidelines for the prevention and extinction of forest fires.
Analysing the capacity of defence against forest fires, dry vegetation fires, in business operators and the population.
Ensuring the enforcement of defence actions against forest fires, specific to the public or private area of the administrative-territorial unit, as well as in the public institutions of the settlement.
Ensuring the functionality of warning, alert and water supply systems, the state of intervention of the Volunteer Service for Emergency Situations of the town of Recas.
Ensuring the performance of fire information and education activities for population.
Checking and enforcing the cooperation plan between the forces designed to take part in fire extinction actions in forests.

### a.2 The phase during the occurrence of the fire and the extinction action

Receiving notifications on a fire forest.
Alerting the Volunteer Service for Emergency Situations of Recas and the intervention subunit of the Banat Inspectorate for Emergency Situations of Timis county (Firemen Department Timisoara 1).
Informing the mayor of Recas on the fire forest in the area of Recas.
Analysing the operative situation and enforcing the Intervention plan.
Alerting the Operative Centre for Emergency Situations of the settlement.
Coordinating the organization of the intervention in case of forest fires, dry vegetation fires or fires at population or business operators, for the available forces, until the intervention subunit of professional firemen arrives on site.
Immediately informing the Inspectorate for Emergency Situations and the Prefecture, by any means, on the occurrence of the fire in the forest and the forces deployed to extinguish the fire.
Informing the head of the Forest Division, the commander of the Recas Police and of the Recas Local Police, the Environmental Guard on the occurrence of the forest fire.
Alerting and concentrating forest workers nearby the affected area.
Concentrating the inhabitants in nearby villages at the site of the fire.
Ensuring the required means of transport so that the involved teams may reach the intervention site (buses, etc.).

Ensuring tools for work divisions.
Ensuring medical care and food for the teams working to extinguish the forest fire.
Ensuring on-site connections with military firemen and the Timis Prefecture, as well as between participant forces.
Informing citizens on the dangers of drought for lands with forests, dry vegetation and agricultural crops of cereals.
Creating news, movies, interviews broadcast on local and national channels during the entire drought period, regarding the exposure of forests to fire risk, raising awareness on fire protection rules.
<p><u>Ensuring the recognition</u> by teams equipped with means of communication, that immediately notify the mayor on the results of site observations:</p> <p>The following are established upon recognition:</p> <p>The type of fire: border fire, tree crown fire, etc.;</p> <p>The propagation speed and wind direction;</p> <p>Areas with sprouts, shallow trees, wood storage;</p> <p>The danger for constructions in the woods, for populated centres or cereal crops;</p> <p>The limits of the fire;</p> <p>The possibility to change the fire propagation speed depending on changes in the wind direction;</p> <p>The possibility to use battle techniques;</p> <p>The existence of obstacles on the propagation direction or alignments where obstacles should be placed, if none.</p> <p>A complex, multi-direction recognition is needed for forest crown fires.</p> <p>The need to use military subunits.</p>
<p><b>Forest fire extinguishing:</b></p> <p>Action of the forest division – Quick concentration of the staff present at the place of the fire or in nearby areas (who may ensure the location and liquidation of the fire in its incipient (development) phase;</p> <p>Concentrating the forces in the “Defence plan against mass fires”, using any available means of transport;</p> <p>Directing work divisions along the main directions of intervention;</p> <p>In the first place, the fire must be confined within the detected limits or, in case of quick evolution, within limits to be established by the extinction head.</p>

**To extinguish forest border fires:**

Mechanical procedures:

- Battering the burnt areas with shovels, rakes or brooms;
- Covering fire with soil or sand;

This procedure is effective, but needs a lot of workforce and time.

Continuity must be ensured in action (by exchange). Otherwise, the interruption of the activity results in the re-appearance of fire.

Creating stripes of a variable width (1-2 m), by cleaning the wooden mass;

Digging ditches, creating dams or mineralized belts on the fire propagation direction.

They are made when the fire does not advance quickly, by manual tools or mechanical means (ploughs or bulldozers).

Extinguishing fire with water when the battle equipment of the Service for Emergency Situations or of the professional firemen arrived on site can be used.

Chemical procedures:

- Dispersing solid or liquid chemical substances in the burning area, by means of land-based devices (tools or other aggregates) or utility aviation (planes or specially equipped helicopters for the dispersion of chemical substances belonging to agricultural units or specialized companies).

Confining the fire with teams of individuals and concentrating the main forces on the fire development direction.

**To extinguish fires caused by fallen trees:**

The affected area (with fallen trees) is isolated with fire-stopping belts by cleaning any vegetation that might trigger the development of the fire.

The extinction must begin while the fire is quiet.

Each fallen trunk will be carefully examined and all hotspots hidden under roots, holes, etc. will be extinguished;

If enough forces are available, once the fire liquidation operation starts, the area shall be cleaned from the carbonized trees, so that they will not reignite.

The fire will be located and liquidated across sectors.

**To extinguish underground fires (under the leaves):**

Establishing the route of the fire according to the smoke and heat released by the fire.

Locating the fire through confinement, using a mineralized area, 1-2 m wide, made through deep digging and ditch filling with water or by spraying walls with chemical substances to increase fire resistance.

Uncovering underground fires by means of digging and liquidating them through battering and earth setting.

**To extinguish fires caused by tree crowns:**

Methods and procedures adapted to the advance rate of the fire shall be used.

Because of the high travelling speed, the crown fire cannot be confined to the detected limits and must be met with a natural or artificial obstacle.

Obstacles are set by deforestation. The fallen trees are removed from the deforested area, and the area is cleaned of vegetation.

If the fires cannot be removed, they will be oriented with their trunk facing the direction where the fire is expected to come from. The obstacle must be supervised by people equipped with technical means to extinguish the sparkles likely to fall over crowns.

The use of the procedure: "fire against fire", only when the crown-based fire is very strong and there is no certainty that the other procedures result in the location and subsequent liquidation of the crown fire.

This extinguishing procedure is only used as a last resort.

Conditions:

The counter-fire must be triggered at a large enough distance in front of a natural or artificial obstacle, so that a large enough area can be deforested through burning, and an area without vegetation is found when the fire comes;

The starting base of the counter-fire must be chosen very carefully;

Surveillance staff must be available on the entire area where the counter-fire is triggered;

The possibility to direct the counter-fire toward the fire must exist;

An area to be cleaned by the counter-fire must exist or be created at the place where the fire meets the counter-fire;

The counter-fire is only triggered when the fire is quiet;

The counter-fire is only triggered after all measures to supervise the area and the surroundings have been taken;

All required means of intervention must be ensured on site.

Citizens should be informed on a daily basis on this hazard, through the press, radio, TV.

**B. Procedures used in case of floods and hazardous weather events**

The procedure is enforced in case of emergency situations generated by floods, pursuant to natural overflows of water or leakages from slopes, as well as in case of storms, tornadoes, drought, hailstone, etc. so as to maintain and emphasize a climate of normality, to ensure prevention and limit consequences.

The procedure will be used for defence against floods and hazardous weather events, as well as to manage the emergency situations generated by them.

An operative centre for emergency situations, operating on a temporary basis, shall be established at the level of the Recas municipality, by decision of the mayor.

The operative centre shall include the staff of the Recas municipality's own facilities.

The following steps may appear during the management of emergency situations:

**THE CARE SITUATION.**

It has the meaning of a special situation and is not necessarily a danger.

Measures taken in the care situation:

- more frequent observations and measurements to confine the phenomenon and to forecast its evolution;
- checking defence constructions and enforcing conditions for the leakage of large waters;
- informing on the possibility of accidental pollution.

**THE ALERT SITUATION**

Characterized by a possibly hazardous evolution of phenomena, seen in:

- a continued increase of levels on the water course;

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- an increased intensity of precipitations or wind speed;
- confirmed accidental pollution, that needs intervention and others.

The trigger of the alert state results in the emergency situation committees entering an operative status. Activities are both aimed at confining the phenomenon and at preparing for any occurrence of a hazard.

### **THE HAZARD SITUATION**

Triggered when the hazard becomes imminent and exceptional actions must be taken to limit flood effects, such as:

- Evacuating population, animals or material goods;
- Special actions to exploit hydrotechnical constructions for flood defence;
- traffic restrictions on some roads and bridges;
- fighting accidental pollution with serious effects on the ecosystem (changes in water quality parameters, destruction of fauna and fishes, of the environment and others, or exceeding the scope of competence).

### **DESCRIPTION OF THE PROCEDURE.**

#### **b.1 The pre-disaster phase**

Coordinating the periodical check of the operation of the hydro-meteorological information flow to warn - alert the population;
Ensuring the update of the informational flow scheme in defence plans and establishing the means of tele-communications to be used;
Updating the map with the floodability areas for the settlements in Recas.
Coordinating the periodical check of the technical and functional status of all flood defence constructions within the area of the administrative-territorial units, irrespective of the holder, as well as the actions to check the maintenance of water courses and torrents;
Ensuring the elaboration of the defence plan against floods, frosts and accidental pollution;
Ensuring the elaboration, check and update of the "Plan of evacuation from floodable areas"
Ensuring the equipment of the Local Committee for Emergency Situations, as well as intervention teams, with specific materials.
Ensuring the establishment of stocks of materials and means of intervention in case of floods, according to equipment guidelines.
Ensuring the required means to warn and alert the population in flood risk areas.
Pursuing the elaboration of the flood risk map and introducing it within the General Land Planning, as well as complying with the construction system in floodable areas.
Approving/endorsing plans for preparing population regarding the knowledge of warning-alert signals, measures and behaviour guidelines, by means of trainings and periodical exercises for the simulation of emergency situations.
Pursuing the performance of slope arrangement works to prevent floods.
Coordinating the performance/check of works for the leakage of rainwater to settlements (ditches, gutters, collecting channels, non-permanent valleys).
Periodically checking the risk sources within the settlement and ensuring the update of the flood defence plan.
Ensuring a permanent municipality team based on the received hydro-meteorological warnings.
Taking action to clean shores so as to avoid blockages in bridges and platforms with various materials.

## b.2 The phase during the disaster.

### The CARE status. YELLOW code

Ensuring an immediate extraordinary meeting of the Local Committee for Emergency Situations.
Ensuring the operation of the informational flow between the Local Committee for Emergency Situations and the Operational Centre of the County Inspectorate for Emergency Situations, as well as the operative centre of the water management system.
Ensuring the transmission/receipt of warnings and forecasts in all sights of the potentially affected areas.
Making sure that actions are taken to limit the effects of floods by their own intervention teams, by the owners of flood defence works, by specialized business operators, etc.
Ensuring the permanent information of population on the urgent actions to be taken (through media)
Taking actions to avoid blockages, especially in the areas of bridges, platforms, water intakes, exits and other critical areas.
Ensuring the permanent surveillance of water courses and hydrotechnical constructions with a flood defence role and, as the case may be, the over-heightening and reinforcement of dams and shores according to the forecast maximum quotas.
Coordinating the distribution of forces and means of intervention in the affected areas.

### The ALERT situation. ORANGE code

Ensuring a permanent presence at the municipality of Recas if the alert state is directly established.
Ensuring the operation of the informational flow between the Local Committee for Emergency Situations and the Operational Centre of the County Inspectorate for Emergency Situations, as well as the operative centre of the water management system.
Enforcing actions established when the alert status is declared at the level of the settlement, in the endangered areas and checking the enforcement of actions stipulated in the flood defence plan.
Ensuring the transmission/receipt of warnings and forecasts in the settlements and sites of the affected areas.
Ensuring the permanent information of population on the urgent actions to be taken.
Coordinating the enforcement of actions to avoid blockages, especially in the areas of bridges, water intakes, exits and other critical areas along water courses.
Introducing restrictions in the consumption of water and food from the affected area.
Taking actions for warning-alert regarding the sites that may be flooded or located in a floodable area, in case of imminent danger of damage to hydrotechnical constructions.
Organizing self-evacuation and preventive evacuation of people, animals and goods outside potentially floodable areas.
Requesting forces of order to ensure the guard of the evacuated goods.

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Organizing the safety of goods that cannot be evacuated, by raising them to a higher level or by anchoring them.
Taking action to cut the supply of power and gas in the flooded areas, in order to prevent electrocution or intoxication, technological accidents, etc.
Establishing routes to go around the flooded area and ensuring order during evacuation and rescue operations, with the help of forces of order.
Coordinating actions to rescue people, animals, technology, equipment and materials.
Deciding the heightening and reinforcement of dams and shores according to the forecast maximum quotas.
Organizing actions to limit the extension of breaches in dams and reservoirs through the performance of provisional works.
Pursuing the enforcement of measures for the evacuation of water from overflows, infiltrations and precipitations, as well as for the evacuation of water from the affected buildings and technological channels.
Organizing the distribution of aid to the affected population.
Coordinating the enforcement of the sanitary-epidemic measures for the prevention of epidemics.
Ensuring the sheltering, feeding and supply of veterinary assistance to evacuated animals.
Ensuring the enforcement of sanitary-epidemic measures to prevent epidemics.

### The HAZARD situation. RED CODE

Ensuring the operation of the informational flow between the Local Committee for Emergency Situations and the Operational Centre of the County Inspectorate for Emergency Situations, as well as the operative centre of the water management system.
Maintaining the alert status at the level of the settlement, in the endangered areas and checking the enforcement of actions stipulated in the plan.
Pursuing the enforcement of warning-alert regarding the sites that may be flooded or located in a floodable area, in case of imminent danger of damage to hydrotechnical constructions.
Ensuring the transmission of warnings and forecasts to all the settlements and sites of the affected areas.
Ensuring the permanent information of population on the urgent actions to be taken.
Ensuring the enforcement of actions to avoid blockages, especially in the areas of bridges, water intakes, exits and other critical areas along water courses.
Introducing restrictions in the consumption of water and food from the affected area.
Organizing self-evacuation and preventive evacuation of people, animals and goods outside potentially floodable areas.
Requesting forces of order to ensure the guard of the evacuated goods.
Organizing the safety of goods that cannot be evacuated, by raising them to a higher level or by anchoring them.

Taking action to cut the supply of power and gas in the flooded areas, in order to prevent electrocution or intoxication, technological accidents, etc.
Establishing routes to go around the flooded area and ensuring order during evacuation and rescue operations, with the help of forces of order.
Coordinating actions to rescue people, animals, technology, equipment and materials.
Deciding the heightening and reinforcement of dams and shores according to the forecast maximum quotas.
Coordinating the distribution of forces and means of intervention in the affected areas.
Organizing actions to limit the extension of breaches in dams and reservoirs through the performance of provisional works.
Pursuing the enforcement of measures for the evacuation of water from overflows, infiltrations and precipitations, as well as for the evacuation of water from the affected buildings and technological channels.
Providing accommodation to affected persons, water, food, commodities and medical care.
Ensuring the sheltering, feeding and supply of veterinary assistance to evacuated animals.
Ensuring the distribution of aid to the affected population.
Ensuring the enforcement of sanitary-epidemic measures to prevent epidemics.
Ensuring the identification of victim, affected people and drawing up the list of disappeared individuals.
Organizing the supply of religious assistance and burial of victims.
Pursuing the collection, transport and incineration of dead animals.

### C. Procedures used in case of destructive geological phenomena.

#### **Landslides and earthquakes.**

Unlike other risks, landslides and earthquakes are hard to locate both on a macro and micro level.

According to the Land Planning Project of the Timis county, December 2011 edition, drawn up by the Timis County Council, page 99, the territory of Recas is classified as follows:

- Potential of landslides = low-high;
- Type of landslides, according to Law 575/1998-2006:
  - o primary landslide = NO;
  - o reactivated landslide = YES.

The maximum degree of a seism in the area of Recas is level VII on the Mercalli scale.

The actions are included in the pre-disaster phase and refer to:

- Monitoring areas likely to undergo landslide, so as to assess the balance conditions of earth masses, respectively their stability, as well as the evolution of the movement of the earth mass, in order to establish the works to be performed for the prevention or stabilization of landslides;
- Pursuing the evolution of stabilization works performed where the land has undergone changes.

Protection and intervention actions will be performed in three distinct phases, as follows:

- in the prevention period
- in the incidence period
- in the post-disaster period

**DESCRIPTION OF THE PROCEDURE**

**c.1 In the prevention period**

Deciding the update of the nominal composition of the local committee for emergency situations, on an annual basis and whenever needed.
Coordinating periodical check actions on the operation of the informational-decision-making flow, for warning, notification, transmission of data, information, as well as their processing and storage, for the transmission of decisions by relevant factors to the stakeholders.
Establishing short and long-term action programmes including actions to reduce the seismic risk of constructions, especially those with vital functions for the town and the subordinated villages (technical expertise of constructions and their classification in the 1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> seismic risk classes).
Ensuring the compliance with the provisions of Law 10 as subsequently amended, on construction quality, through the Inspectorate for Constructions.
Deciding the elaboration of earthquake education materials for the affected population.
Ensuring conditions for the operation in case of earthquake at the level of the Local Council for Emergency Situations: spaces, utilities, structures, equipment, etc.
Organizing and performing public alert exercises to check the preparation of population and intervention forces.

**c.2. In the disaster phase**

Immediately activating the Temporary Operative Centre of the Local Committee for Emergency Situations and the Volunteer Service for Emergency Situations.
Informing and alerting the population on the created situation, with the specific means for such types of actions, as well as with the technical means owned by the civil protection system.
Performing the management of the entire intervention operation in case of public emergency generated by earthquakes/landslides.

**D. Procedures used after the intervention for cleaning affected locations in the project area - Recas and neighbouring villages: Izvin, bazoş, Stanciova, Herneacova, Petrovaselo and Nadaş**

## DESCRIPTION OF THE PROCEDURE

### **a. After the fire is extinguished.**

Cleaning the areas affected by the forest fire from trees that have fallen or have been affected by the fire and other combustible materials, to make sure they do not reignite.
Taking partially carbonized residues out of the area where the forest fire has occurred.
The area should immediately enter operation, so as to discard fire reignition
Taking goods, people and animals out of the affected area.
Drawing up the Fire Report and sending it to the Inspectorate for Emergency Situations of the Timis county.

### **b. After the occurrence of floods and hazardous weather events.**

Ensuring the permanent functioning of the operative centre within the municipality.
Ensuring the continued permanent information of population on the urgent actions to be taken.
Taking actions to avoid blockages, especially in the areas of bridges, water intakes and exits.
Maintaining restrictions in the consumption of water and some food.
Maintaining the guard of the evacuated goods.
Deciding to maintain routes to go around the flooded area (where applicable) and ensuring order during evacuation and rescue operations.
Pursuing the enforcement of water evacuation measures in the affected areas.
Providing accommodation to affected persons, water, food, commodities and medical care.
Ensuring the sheltering, feeding and supply of veterinary assistance to evacuated animals.
Ensuring the distribution of aid to the affected population.
Taking actions to sanitize water supply facilities and sources, as well as affected lands.
Ensuring the enforcement of sanitary-epidemic measures to prevent epidemics and epizooties.
Taking actions for the restoration of affected infrastructure (ways of communication and bridges, restoration of telecommunication and power supply lines, damages in water and gas pipes).
Identifying the required material and financial resources for the restoration of damaged or destroyed residences.
Coordinating the activities of assessment of damages (both physical and in terms of value) determined by floods and the methods to restore the affected facilities.
Pursuing the restoration of affected hydrotechnical constructions with a role of defence against floods and the recovery of the used materials.
Ensuring the identification of victim, affected people and drawing up the list of disappeared individuals.

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Organizing the supply of religious assistance and burial of victims.

Ensuring the collection, transport and incineration of dead animals.

Ensuring the elaboration of the synthetic report on the defence against floods, hazardous weather events and its submission to the County Inspectorate for Emergency Situations and to the operative centre of the water management system.

Organizing the restoration of the action capacity of the protection-intervention system.

### **c. After destructive geological phenomena have occurred.**

Ensuring the permanent functioning of the operative centre within the municipality.

Ensuring the continued permanent information of population on the urgent actions to be taken.

Performing the management of the entire intervention operation in case of public emergency generated by earthquakes/landslides.

Organizing cooperation between the forces taking part in the intervention.

Evacuating people, animals and material goods (when needed).

Ensuring the conditions for hosting and accommodating affected individuals and supplying food to them.

## Chapter III

### **Drawing up a joint strategy in cooperation with the beneficiary - Recas Municipality, Romania and our project partner - Zagubica, Republic of Serbia**

#### **Suitable prevention and protection in case of fires and natural disasters (earthquakes, floods, landslides, etc.)**

The strategy adopted by the Recas Municipality on the management of fire risk and risk of natural disasters caused by fires, floods, hazardous weather events, earthquakes, landslides, must include a range of actions at the level of the entire administrative and territorial units regarding the education of population in risk areas, the development and training, through protection plans, of the Volunteer Service for Emergency Situations, alerting, warning and informing population, the funding of such measures and of the rehabilitation of affected areas.

The strategy is the result of a wide combination between the measures and actions preceding the occurrence of phenomena, management actions during their occurrence and the ones taken after the disaster, i.e. for the removal of consequences, for reconstruction and lessons learned pursuant to the phenomena.

**General objectives** of the defence strategy against natural disasters are economic, social and environmental.

**Social objectives** refer to protecting population and the community in general against fires and natural disasters, by ensuring an acceptable protection level, as well as a proper development capacity, in the conditions of the taken risks.

**Environmental objectives** refer to risk management maintaining a balance between economic and social development and specific environmental goals.

**General objectives** refer to:

Increasing life quality by reducing damages, but also being prepared for the occurrence of similar phenomena in the future;

Suitably using resources to create, maintain and exploit infrastructure with a role of reducing risk of natural disasters;

Efficiently controlling land use, by forbidding the establishment of new constructions and the performance of activities in areas frequently exposed to fires and natural disasters;

Reducing indirect economic losses by quickly resuming activities after natural disasters;

Improving collective response in case of a natural disaster; and

Reinforcing the capacity of adaptation and restoration of a functional level, in the shortest delay after the event;

Reducing the impact of fires and natural disasters on the flora and fauna of the area.

The general objectives are equivalent to specific objectives for the 3 previously mentioned categories: economic, social and environmental.

**Specific economic objectives** refer to protecting the infrastructure of the Recas town against fires and natural disasters, as well as guaranteeing development opportunities for the future generations.

They refer to:

Preventing or minimizing economic losses, by reducing the risk of fires, floods and earthquake, in populated areas, economic facilities and personal items.

Preventing or minimizing economic losses by controlling land use, promoting low vulnerability agriculture in the exposed areas and creating flood protection systems.

**Specific social objectives** refer to protecting population and the community in general against fires and natural disasters, by ensuring an acceptable protection level, as well as a proper development capacity, in the conditions of the risks of such phenomena.

They refer to:

Reducing the risk of floods and other natural disasters to human communities by means of proper preparation, efficient forecast and warning on floods, providing professional assistance during the floods and afterwards, so as to restore safe and normal living conditions;

Informing, consulting and ensuring the participation of the exposed population regarding the risk management strategy and plan for fires and natural disasters.

Preventing and reducing risk of fires and natural disasters for public goods (hospitals, schools, etc.), vital infrastructure (water, gas, power supply networks, etc.), public utilities, public facilities and entertainment areas.

Ensuring access to critical infrastructure (water, gas, energy sources and supply systems, bridges, platforms, hospitals, schools, population protection works, etc.) during the occurrence of natural disasters;

Safe evacuation and ensuring the required conditions for survival.

**Specific environmental objectives** refer to risk management maintaining a balance between economic and social development and specific environmental goals.

They refer to:

Considering the environmental functions of floods, as aquifers are replenished and lateral connectivity, required for the reproduction of aquatic species, is ensured;

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Creating and/or preserving space for rivers, avoiding defence works and rectification of water courses along great distances (on a local and cumulated basis);

Enforcing sustainable techniques associating environmental effectiveness with cost-based efficiency (enforcement of best practices);

Protecting and improving land quality and, where possible, encouraging changes in the agricultural practice, so as to prevent or minimize torrent leakage and associated floods, pursuant to intensive agricultural works.

Pursuant to the implementation of the Strategy for prevention and protection in case of fires, floods and other natural disasters, the expected results will be in accordance with the practical actions taken by the Recas Municipality, the Recas Local Council, the Volunteer Service for Emergency Situations of Recas, as well as other relevant institutions: the Timis County Council, the Banat Administration of Waters, the Timis County Prefecture, the "Banat" Inspectorate for Emergency Situations of Timis county (military firemen), etc.

Such measures refer to:

A preliminary assessment and improvement of the knowledge of risk to fires and natural disasters;

Preparing population, permanent feedback with their interests and needs, so as to ensure a climate of trust in the authorities' activity;



Dissemination in schools and for citizens  
on the behaviour in emergency situations in Recas, Romania;



Dissemination in schools  
on the behaviour in emergency situations in Zagubica, Serbia;

Strictly controlling authorizations for land use and construction of residences, as well as economic, social, touristic buildings, etc.;

Improving the management of water flows and courses on the administrative territory;

Reinforcing the defence capacity against fires and floods;

Reducing the vulnerability of agricultural land and the road and railway communication infrastructure against natural disasters;

Reducing the vulnerability of environmental infrastructure and protected ecosystems against natural disasters.

Therefore, the following results may be expected for the town of Recas:

Reinforcing the role of the Recas Municipality as the responsible institution for the management of emergency situations caused by fires and natural disasters and ensuring timely intervention with the forces and means of the Volunteer Service for Emergency Situations;

Observing and enforcing the provisions in the field of emergency situations in floods in the area of Recas, at the level of citizens, institutions and the private environment;

Reducing the number of persons and goods affected by emergency situations;

Enforcing the land planning provisions in the construction permits issued by the Recas Municipality;

Ensuring the equipment with state-of-the-art intervention technology, with modern warning-alert means of the Volunteer Service for Emergency Situations and its preparation for efficient intervention.

### **The status of cooperation between Romania and the Republic of Serbia in the management of risk situations caused by natural disasters.**

Cooperation with the Republic of Serbia in the field of natural disasters is currently regulated by the Agreement between the People's Republic of Romania and the Federal People's Republic of Yugoslavia on hydrotechnical issues along hydrotechnical systems and water courses at the border or crossed by the state border, signed on April 7, 1955 in Bucharest, which is no longer valid.

Therefore, a new agreement is in progress between the two countries, so as to reinforce relevant cooperation on a legal level.

Based on this agreement, Romania and Serbia may provide assistance to one another, on demand, in case of imminence or occurrence of a disaster whose consequences cannot be completely removed through the efforts and means of the state whose territory is threatened or affected.

The agreement will regulate the principles and technical means of development of actions to forecast, prevent, assess, limit and remove the effects of disasters, in accordance with the relevant requirements and recommendations on international cooperation.

Moreover, the document will include provisions related to the Mixed Committee, the means to provide assistance, the coordination and management of assistance operations, the temporary evacuation of endangered or affected population, border crossing, aid transfer over the border, use of ships and aircraft, damages, cooperation with international organizations.

#### **The relevant authorities for the enforcement of the Agreement are as follows:**

- a) On behalf of the Romanian government - the Ministry of Internal Affairs - Department for Emergency Situations, through the General Inspectorate for Emergency Situations.
- b) On behalf of the Government of the Republic of Serbia, the Ministry of Internal Affairs - Emergency Management Sector.

## **Chapter IV**

### **Drawing up joint procedures for both partners, the main beneficiary - Recas Municipality, Romania and our project partner - Zagubica, Republic of Serbia, in case of fires and natural disasters (earthquakes, floods, landslides, etc.)**

#### **Cross-border and regional cooperation between Recas and Zagubica envisages:**

Creating a monitoring system allowing for direct relations between the two communities, quick and accurate information for the management of emergency situations in case of fires and natural disasters and the implementation of preventive actions.

Informing population with a view to raising the citizens' responsibility in terms of self-defence and preparation for preventing and discarding the effects of disasters;

Building a climate of trust between participants, based on shared ideas and new initiatives, such as:

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- Creating a joint group of experts in the field of emergency situations;
- Developing joint workshops in the field;
- Developing joint programmes for training Volunteer Services for Emergency Situations (volunteer firemen);
- Reducing the time for sending the flow of information, data and decisions on emergency situations by means of IT techniques: internet, television, radio, mobile and fixed phone networks;
- Optimizing the decision making process and emergency intervention management by the authorities of the two settlements.

### **Proposals.**

1. Entering full agreements on humanitarian assistance in case of disasters, by Recas (Romania) and Zagubica (Serbia) according to the provisions of the legislation of each country.
2. Including the issues of disaster defence in the development strategy of the two communities.
3. Optimizing the activity of structures ensuring the management of defence actions against effects caused by natural disasters on the territory of the two towns.
4. The participation of decision makers in the two towns in the main activities of informing the population and preparing intervention forces, organized by each authority.
5. The direct participation of intervention teams and relevant individuals in Exercises and applications for preparation or simulation, in terms of emergency situations, organized on the territory of Recas-Romania and Zagubica-Serbia.
6. Preparing and developing joint exercises and applications, with the forces and resources dedicated to the intervention, based on a medium and long-term programme.
7. Developing a joint electronic database on the risks of natural disasters likely to occur on the administrative territory of each party and the actual capacities of response structures.

### **Joint intervention procedures in emergency situations caused by natural disasters**

Pursuant to the development of thematic groups and video conferences, during the development of the project, as well as the supply of the study drawn up by the Serbian part, in English language, with the title "***Development of the Study assessing aptitude of the terrain and eco-system for outbreak and spreading of fires and analysis of area characteristics for the purpose of prevention and adequate protection against fires, flooding and other emergency situations with proposed measures for local community and population of Municipality Zagubica. Brochure***", joint prevention and intervention procedures have resulted, of both authorities and specialized forces, pursuant to emergency situations caused by natural disasters - fires, floods, earthquakes, etc.

A strong similarity also resulted in terms of intervention procedures, forces and means of intervention, both during the prevention and the occurrence of emergency situations.

Details are provided in Annex no. 4

During the implementation of European Union directives in both countries, agreements may be entered at an institutional level in the following period, allowing the local authorities of Recas and Zagubica to fully cooperate in the field of emergency situations caused by natural disasters.

## Chapter V

**Drawing up a map of environmentally protected areas and risk areas in the project area: the town of Recas and neighbouring areas: Izvin, Bazos, Stanciova, Herneacova, Petrovaselo and Nadas.**

### **Main references**

The maps of protected environmental and risk areas in the project area represent documents showing the potential areas with a risk of fire, floods and destructive geological events occurring and likely to occur in the area of Recas and subordinated villages.

The purpose of such maps is the need of a work tool for the municipality of Recas, for the Local Council, as well as the Local Committee for Emergency Situations for:

- Accurate decision making support for assessing the occurred events and drawing up intervention plans, in case of an emergency situation;
- Monitoring specific hazards and risks, as well as their negative effects;
- Raising the population's awareness on the existing risks, both in the community and in their own households;

- Safe location and accurate dimensioning of all kinds of constructions;
- Evacuating the threatened population or goods to safe, previously established sites;
- Search and rescue for persons surprised by special events;
- Allocating funds, means of intervention and modern vehicles for the Volunteer Service for Emergency Situations of the Recas town.

The maps were created for the perimeter of the Administrative-territorial unit of Recas, as resulting from the land planning documentation of the settlement.

The validity of information was verified by studying the documents available in the relevant offices of the Recas Municipality, by on-site information together with the specialists of the Recas Municipality, as well as from discussions with relevant individuals, members of the Recas administration.

#### **a. General map of environmentally protected areas and risk areas. Annex no. 1**

It represents the materialization of elements presented in maps specifically drawn up for each individual risk in the specialized study.

The protected environmental area identified as ROSCI0109 Lunca Timisului was specifically represented, as a community importance site, based on Order no. 2387/2011 on the amendment of the Order of the Minister for Environment and Sustainable Development no. 1964/2007 on the establishment of the status of protected natural area of sites with community importance, as an integral part of the Natura 2000 European ecological network in Romania.

This area is located along the Timis river, on a distance of about 8 km, representing about 1% of the total surface of the protected area.

This area, together with other data held by the Volunteer Service for Emergency Situations of Recas, will result in the elaboration of a full documentation for the mayor and the staff with attributions in the field of emergency situations, of the Recas Municipality.

#### **b. Fire risk map. Annex no. 2.**

It was created through the method of statistical evaluation of fire risk, for the following items:

Forests existing in the administrative-territorial unit, located near Herneacova, Stanciova, Nadas and Bazos, are a source of risk for the occurrence of a forest fire, especially during prolonged drought, for natural causes, as well as due to the negligence of inhabitants or tourists.

Such fires can also occur as forest border fires, fires under the leaves, fires in an area with trees that are down on the ground or tree crown fires.

The dry vegetation in the most frequent areas in administrative-territorial units, located near Izvin and Stanciova, is a source of risk for fires and may cause significant hazard for both people and other crops nearby.

Cereal crops located near Izvin, Recas, Petrovaselo and Bazos are a source of risk for the occurrence of fire and may cause significant hazard, especially due to the negligence of inhabitants.

The households of inhabitants residing in the area of the administrative-territorial unit are the main source of risk for a fire all along the year, both due to negligence in supervising open fire, and for the improper use of improvised facilities, technical faults, etc.

The major business operators on the territory of the administrative-territorial unit, especially holders of flammable substances such as the Oil Product Distribution Facility in Recas, are a source of risk for a major fire, if rules regarding the use of open fire, smoking, safe handling of oil products during their transfer or storage are not strictly observed.

### **b.Flood risk map. Annex no. 3**

This includes the documentation indicating floodable areas along water courses in the administrative-territorial unit, i.e.

The Timis river, flowing on the southern border of the administrative-territorial unit and near Bazos, is a source of risk in the floodable area, between protection dams, for the animals of inhabitants and for the protected fauna and flora, through the existing environmental programmes.

The Bega channel, crossing the administrative-territorial unit between Bazos and Recas, is not a direct risk factor, as its water level is fully controlled. However, in some parts, the absence or damage of protection dams may be risk factors for humans and animals.

The Gherteamos stream, crossing the Stanciova village, represents a source of risk in the floodable area of this settlement, at a confluence with a nameless stream, in case of strong precipitations in a short time or as snow melts suddenly.

The Bacin stream, crossing the Nadas village, represents a source of risk in the floodable area of this settlement and for the Herneacova area as well, in case of strong precipitations in a short time or as snow melts suddenly, due to the deforested hills around both the village and the entire valley.

The Curasita stream, passing at the eastern and southern border of the Recas village, represents a source of risk in the floodable area of the settlement, in case of strong precipitations in a short time or as snow melts suddenly, but also in case of negligence of the inhabitants regarding the disposal of waste in the existing evacuation channel.

The Potoc stream, crossing between the Recas town and the Izvin village, is a source of risk in the floodable area of this settlement, in case of strong precipitations in a short time or as snow melts suddenly, due to the deforested hills located in the area of Ianova and Cramele Recas.

In all above mentioned cases, human and material damages may be significant, in terms of potentially affected workers, the vulnerable economic activities in the potentially affected area, including infrastructure, the affected cultural or touristic sites.

### **c. Risk map for destructive geological phenomena. Annex no. 3**

The area located in the tectonic fault is marked on the map of earthquake and landslide risks.

The map is the documentation indicating the main sources of risk located in the administrative-territorial unit.

These are:

**The position of the Buzias - Recas -Vinga tectonic fault**, crossing the administrative-territorial unit on the median line of the studied location and resulting in earthquakes ranging from degree II to degree VI on the Mercalli scale, in Recas and all subordinated villages.

When such an earthquake occurs, the movement is felt by everyone, causing panic, plaster falls off the walls of buildings, significant damages occur in poorly built buildings, which may cause damage to surprised and unprotected persons.

**Landslides** in the hill area of the administrative-territorial unit, that may occur especially in the area of the Stanciova and Nadas villages, represent a source of risk for the households located next to them.

## Chapter VI

### **Conclusions and proposals.**

Pursuant to the performance of the study and the implementation of the Strategy for prevention and protection in case of fires, floods and other natural disasters, the expected results will be in accordance with the **practical actions** taken by the Recas Municipality, the Recas Local Council, the Volunteer Service for Emergency Situations of Recas, as well as other relevant institutions: the Timis County Council, the Banat Administration of Waters, the Timis County Prefecture, the "Banat" Inspectorate for Emergency Situations of Timis county (military firemen), etc.

**Such measures refer to:**

- A preliminary assessment and improvement of the knowledge of risk to fires and natural disasters;
- Preparing population, permanent feedback with their interests and needs, so as to ensure a climate of trust in the authorities' activity;
- Strictly controlling authorizations for land use and construction of residences, as well as economic, social, touristic buildings, etc.;
- Improving the management of water flows and courses on the administrative territory;
- Reinforcing the defence capacity against fires and floods;
- Reducing the vulnerability of agricultural land and the road and railway communication infrastructure against natural disasters;
- Reducing the vulnerability of environmental infrastructure and protected ecosystems against natural disasters.

**The following results may be expected for the town of Recas:**

Reinforcing the role of the Recas Municipality as the responsible institution for the management of emergency situations caused by fires and natural disasters and ensuring timely intervention with the forces and means of the Volunteer Service for Emergency Situations;

Observing and enforcing the provisions in the field of emergency situations in floods in the area of Recas, at the level of citizens, institutions and the private environment;

Reducing the number of persons and goods affected by emergency situations;

Enforcing the land planning provisions in the construction permits issued by the Recas Municipality;

Ensuring the equipment with state-of-the-art intervention technology, with modern warning-alert means of the Volunteer Service for Emergency Situations and its preparation for efficient intervention.



The Volunteer Service for Emergency Situations of Recas - current equipment.

Source: Images from SVSU Recas.

The proposals for the implementation of an efficient management of emergency situations in Recas refer to:

1. Including the issues of disaster defence in the development strategy of the possibly affected communities;
2. Performing flood-specific defence works;
3. Optimizing the activity of structures ensuring the management of defence actions against natural disasters;
4. Training population on guidelines for behaviour in case of fires and natural disasters;
5. Exercises and applications with the forces and means dedicated to the intervention;



The Volunteer Service for Emergency Situations of Recas - intervention exercise with the current equipment.  
Source: Images from SVSU Recas.

- 6. Training decision-making factors in the local public administration by assigning them courses, seminars, workshops, applications, etc.;
- 7. Testing the standardized operational procedures within training applications and exercises.
- 8. Developing and updating a joint electronic database on the risks of natural disasters and the actual capacities of response structures.

**Implications for the budget of the Recas Municipality.**

The funds allocated by the Recas Municipality to improve the management of emergency situations likely to appear in the administrative-territorial unit must observe the principle: "The costs of prevention are actual, and the benefits are future".

Since prevention is a permanent activity, logistics should ensure the development of all phases of defence against disasters, so as to analyse the following:

- 1. The supply of funding for programmes for reducing/discarding risks on people's life and safety, on the environment, material and cultural values;
- 2. The supply of funding and performance of programmes to improve equipment for disaster management.
- 3. The purchase of a multifunctional vehicle that may be equipped with snow removal accessories and equipment and for road maintenance during summer.



A multifunctional equipment equipped with snow removal accessories and equipment and for road maintenance during summer.

- 4. The supply of the required resources for the operation of relevant structures for disaster prevention and management, i.e. the Volunteer Service for Emergency Situations of the settlement; the purchase of at least 2 high capacity special vehicles with water and foam.
- 5. Funding programmes to train population on behaviour during the occurrence of emergency situations; the purchase of at least one high-power alert siren.



High power electronic siren, with 4-8 loudspeakers.

6. The budgeting of funds for intervention and management of emergency situations.

7. Replenishing and refreshing the stocks of required materials in case of disasters, available to the Recas Municipality.

**Annexes.**

**Annex no. 1** General map of environmentally protected areas and risk areas in Recas.

**Annex no. 2** Map of environmentally protected areas and risk areas in Recas. Fire risk.

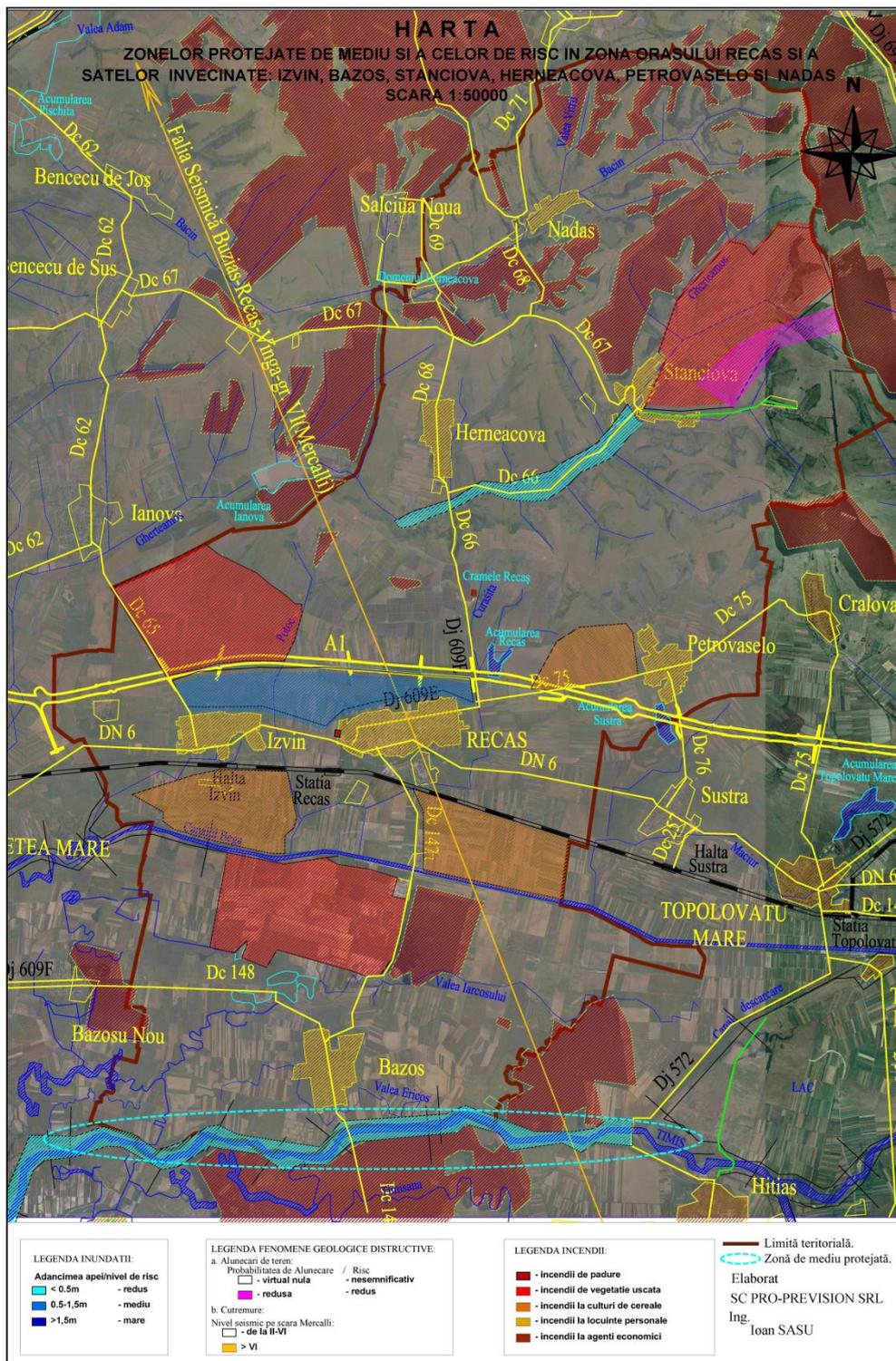
**Annex no. 3** Map of environmentally protected areas and risk areas in Recas. Risk of floods and destructive geological phenomena.

**Annex no. 4** Joint intervention procedures in emergency situations caused by natural disasters.

**Annex no. 5** Guidelines for behaviour in fires, natural disasters (floods and earthquake).

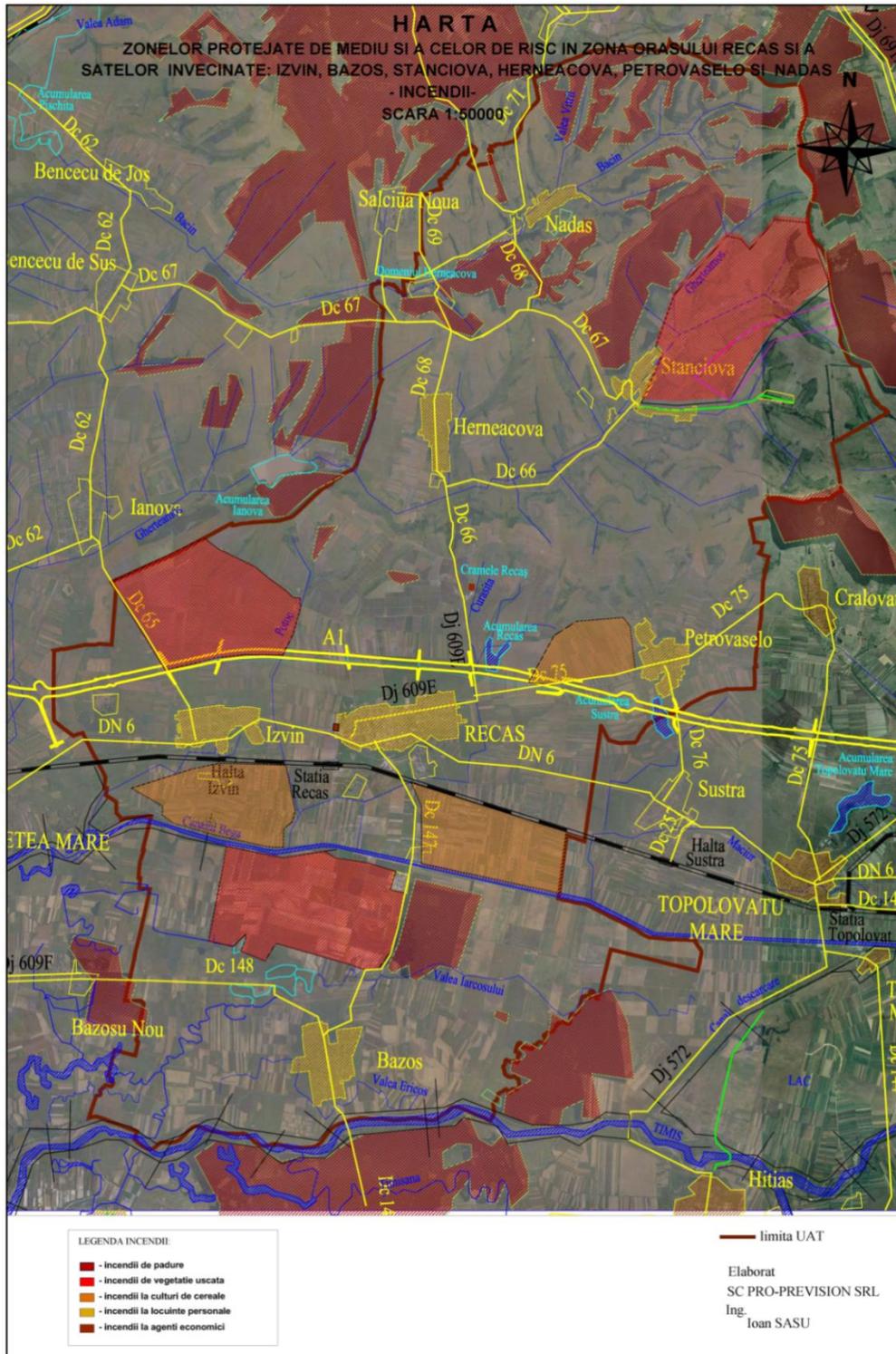
Annex no. 1

General map of environmentally protected areas and risk areas in Recas.



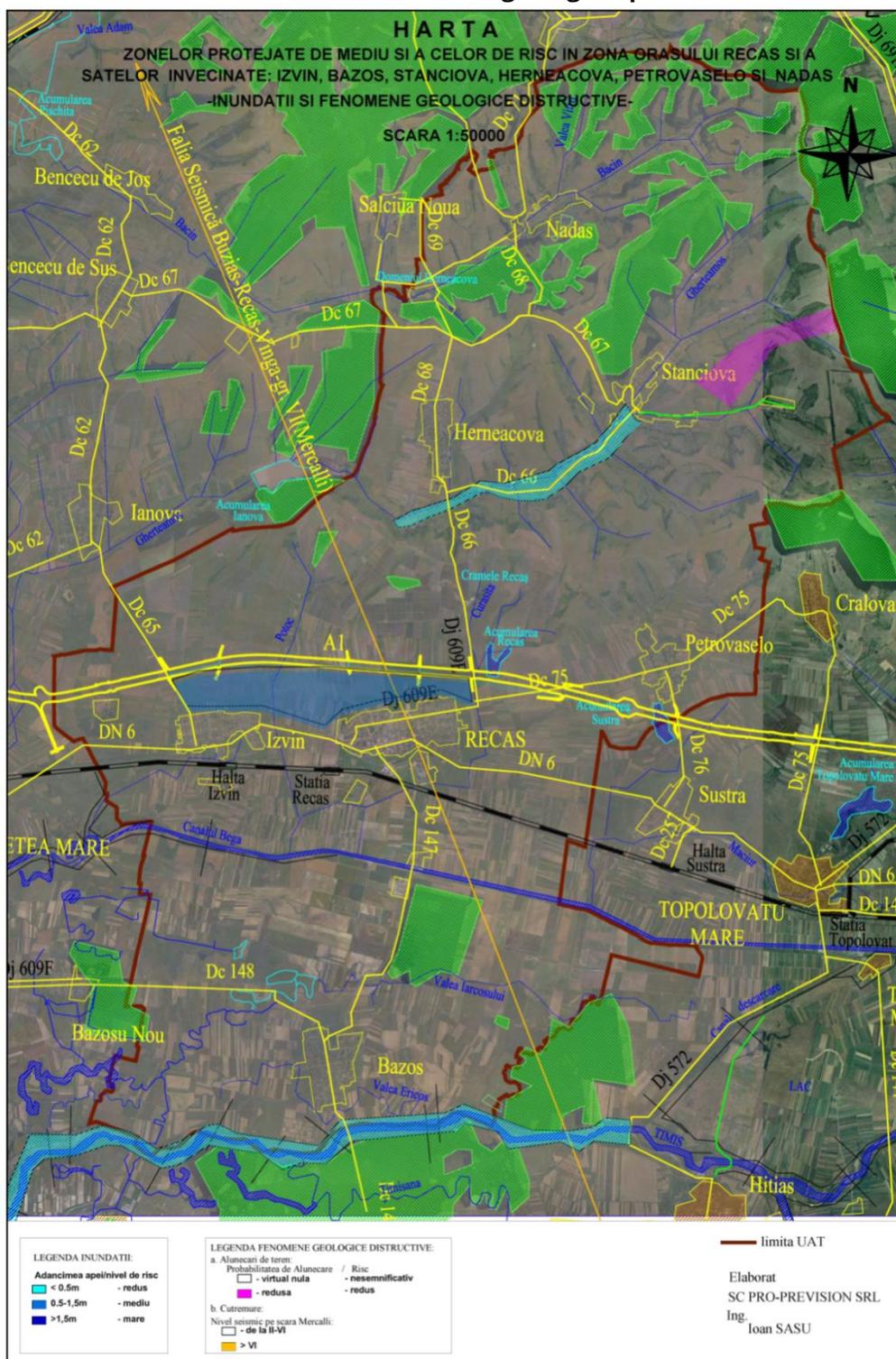
Annex no. 2

Map of environmentally protected areas and risk areas in Recas. Fire risk.



Annex no. 3

Map of environmentally protected areas and risk areas in Recas.  
Risk of floods and destructive geological phenomena.



**Annex no. 4**

**Joint intervention procedures in emergency situations caused by natural disasters**

**Phase: Prevention and training actions for intervention in emergency situations caused by floods.**

<p><b><u>The Serbian part</u></b> The activity of the local self-government and the Zagubica Municipal Administration.</p>	<p><b><u>The Romanian part</u></b> The activity of the mayor, the Local Council and the Operative Centre for Emergency Situations of Recas.</p>
<p>1.Drawing up a local flood protection plan and its review by experts</p>	<p>Ensuring the elaboration of the defence plan against floods, frosts and accidental pollution;</p>
<p>2. Examining all hazards and identifying highly endangered parts and settlements.</p>	<p>Ensuring the update of the informational flow scheme in defence plans and establishing the means of telecommunications to be used; Holding the map with the floodability areas for the settlements in Recas.</p>
<p>3.Planning and building protection measures, such as dams, canals, channels, etc.</p>	<p>Coordinating the periodical check of the technical and functional status of all flood defence constructions within the area of the administrative-territorial units, irrespective of the holder, as well as the actions to check the maintenance of water courses and torrents;</p>
<p>4.Drawing up a wave propagation model in highly vulnerable areas.</p>	<p>Pursuing the elaboration of the flood risk map and introducing it within the General Land Planning, as well as complying with the construction system in floodable areas.</p>
<p>5.Local purchase of equipment for flood protection</p>	<p>Ensuring the elaboration, check and update of the "Plan of evacuation from floodable areas"</p>
<p>6.Training individuals for flood protection</p>	<p>Ensuring the equipment of the Local Committee for Emergency Situations, as well as intervention teams, with specific materials.</p>
<p>7.Monitoring hazards and the hydrological situation at any time and responding to all weather alerts.</p>	<p>Ensuring the establishment of stocks of materials and means of intervention in case of floods, according to equipment guidelines.</p>
<p>8.Planning the evacuation of population and animals from possibly affected areas.</p>	<p>Ensuring the required means to warn and alert the population in flood risk areas.</p>
<p>9.Drawing up an alternate water supply plan.</p>	<p>Coordinating the periodical check of the operation of the hydro-meteorological information flow to warn - alert the population;</p>
<p></p>	<p>Approving/endorsing plans for preparing population regarding the knowledge of warning-alert signals, measures and behaviour guidelines, by means of trainings and periodical exercises for the simulation of emergency situations.</p>
<p></p>	<p>Pursuing the performance of slope arrangement works to prevent floods.</p>
<p></p>	<p>Coordinating the performance/check of works for the leakage of rainwater to settlements (ditches, gutters, collecting channels, non-permanent valleys).</p>

**Phase: Urgent operative intervention measures, after the occurrence of hazardous phenomena with serious consequences**

<p><b><u>The Serbian part</u></b>  <b>The activity of the local self-government and the Zagubica Municipal Administration in a flood-caused event.</b></p>	<p><b><u>The Romanian part</u></b>  <b>Actions developed by the Mayor, the Local Council and the Operative Centre for Emergency Situations of Recas.</b></p>
<p>1.Quick analysis of the situation and issuing suitable conclusions, recommendations, guidelines and orders.</p>	<p>Ensuring a permanent presence at the municipality if the alert state is directly established.</p>
<p>2.Declaring an emergency situation or event depending on the scope of application and of the threat</p>	<p>Ensuring the operation of the informational flow between the Local Committee for Emergency Situations and the Operational Centre of the County Inspectorate for Emergency Situations, as well as the operative centre of the water management system.</p>
<p>3.Calling the responsible institutions at the headquarters of emergency services.</p>	<p>Enforcing actions established when the alert status is declared at the level of the settlement, in the endangered areas and checking the enforcement of actions stipulated in the flood defence plan.</p>
<p>4.Involving all human resources and equipment to respond to the risk.</p>	<p>Ensuring the transmission/receipt of warnings and forecasts in the settlements and sites of the affected areas.</p>
<p>5.Continuously notifying the threats and the taken actions</p>	<p>Ensuring the permanent information of population on the urgent actions to be taken.</p>
<p>6.Performing temporary evacuation and rescue of individuals, animals and material goods</p>	<p>Coordinating the enforcement of actions to avoid blockages, especially in the areas of bridges, water intakes, exits and other critical areas along water courses.</p>
<p>7.Providing assistance centres for the affected individuals.</p>	<p>Introducing restrictions in the consumption of water and food from the affected area.</p>
<p>8.Including and coordinating the activity of all bodies and institutions by means of the central headquarters for emergency situations</p>	<p>Taking actions for warning-alert regarding the sites that may be flooded or located in a floodable area, in case of imminent danger of damage to hydrotechnical constructions.</p>
<p>9.Providing logistic assistance (food, clothes, footwear, medicines and similar items).</p>	<p>Organizing self-evacuation and preventive evacuation of people, animals and goods outside potentially floodable areas.</p>
	<p>Requesting forces of order to ensure the guard of the evacuated goods.</p>
	<p>Organizing the safety of goods that cannot be evacuated, by raising them to a higher level or by anchoring them.</p>
	<p>Taking action to cut the supply of power and gas in the flooded areas, in order to prevent electrocution or intoxication, technological accidents, etc.</p>

	Establishing routes to go around the flooded area and ensuring order during evacuation and rescue operations, with the help of forces of order.
	Coordinating actions to rescue people, animals, technology, equipment and materials.
	Deciding the heightening and reinforcement of dams and shores according to the forecast maximum quotas.
	Organizing actions to limit the extension of breaches in dams and reservoirs through the performance of provisional works.
	Pursuing the enforcement of measures for the evacuation of water from overflows, infiltrations and precipitations, as well as for the evacuation of water from the affected buildings and technological channels.
	Organizing the distribution of aid to the affected population.
	Coordinating the enforcement of the sanitary-epidemic measures for the prevention of epidemics.
Ensuring the sheltering, feeding and supply of veterinary assistance to evacuated animals.	

**Phase: Measures of subsequent intervention for recovery and rehabilitation.**

<b><u>The Serbian part</u></b> <b>The activity of the local self-government and the Zagubica Municipal Administration after an unfavourable event - floods</b>	<b><u>The Romanian part</u></b> <b>The activity of the mayor, the Local Council and the Operative Centre for Emergency Situations of Recas.</b>
1. Permanent reunion of the emergency staff and coordinating the activity of all structures.	Ensuring the permanent functioning of the operative centre within the municipality.
2. Examining the situation after floods and participation in expert services.	Ensuring the continued permanent information of population on the urgent actions to be taken.
3. Assessing damages and providing assistance to vulnerable populations	Taking actions to avoid blockages, especially in the areas of bridges, water intakes and exits.
	Maintaining restrictions in the consumption of water and some food.
	Maintaining the guard of the evacuated goods.

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	Deciding to maintain routes to go around the flooded area (where applicable) and ensuring order during evacuation and rescue operations.
4.Pumping water out from buildings and areas.Cleaning and disinfecting the affected areas.	Pursuing the enforcement of water evacuation measures in the affected areas.
	Providing accommodation to affected persons, water, food, commodities and medical care.
5.Preparing plans with professional repair and assistance services for vulnerable populations	Ensuring the sheltering, feeding and supply of veterinary assistance to evacuated animals.
6.Removal and treatment of dead animals by relevant authorities	Ensuring the distribution of aid to the affected population. Taking actions to sanitize water supply facilities and sources, as well as affected lands.
7.Drying rooms after floods	Ensuring the enforcement of sanitary-epidemic measures to prevent epidemics and epizooties.
8.Logistic assistance for supply of food, water, medicines, clothes, etc.	Taking actions for the restoration of affected infrastructure (ways of communication and bridges, restoration of telecommunication and power supply lines, damages in water and gas pipes).
3.Medical assistance for the vulnerable population	Identifying the required material and financial resources for the restoration of damaged or destroyed residences.
4.Media coverage of all significant factors and facts	Coordinating the activities of assessment of damages (both physical and in terms of value) determined by floods and the methods to restore the affected facilities.
	Pursuing the restoration of affected hydrotechnical constructions with a role of defence against floods and the recovery of the used materials.
	Ensuring the identification of victim, affected people and drawing up the list of disappeared individuals.
	Organizing the supply of religious assistance and burial of victims.
	Ensuring the collection, transport and incineration of dead animals.
	Ensuring the elaboration of the synthetic report on the defence against floods, hazardous weather events and its submission to the County Inspectorate for Emergency Situations and to the operative centre of the water management system.
	Organizing the restoration of the action capacity of the protection-intervention system.

## Annex no. 5

### GUIDELINES FOR BEHAVIOUR

#### IN FIRES, NATURAL DISASTERS (FLOODS AND EARTHQUAKES).

This chapter is dedicated to the rules that must be complied with by the citizens of Recas, so as to protect their life and personal goods, during the occurrence of fires and natural disasters.

Such rules must be included in the Recas Municipality's strategy of communication with the citizens of the town and subordinated villages.

For all emergencies, citizens should be instructed to timely prepare their equipment for survival in emergency situations, that must include the following:

- 1.Lanterns and backup batteries;
- 2.Portable radio and backup batteries;
- 3.Extinguisher with powder and inert gas;
- 4.First aid kit;
- 5.Food (enough for at least three days);
- 6.Potable water (at least one litre for each adult/day).

#### **A class for training students on how to use fire extinguishing means in the Theoretical High School of Recas.**

#### **The citizens' obligations in emergency situations.**

The citizens must:

- observe and apply the civil protection guidelines and rules established by central and local public authorities, as well as the managers of public institutions, business operators or non-governmental organizations, as the case may be;

- enforce the civil protection actions decided by the relevant authorities or by the staff assigned to perform public authority within public emergency services, according to the law;

- notify the relevant authorities or emergency services, by all possible means, as well as by phone, by calling **112**, on the imminent occurrence or the occurrence of any emergency situation they become aware of;

- inform professional emergency services or the police, as the case may be, as well as by phone, by calling **112**, on the discovery of ammunition or ammunition elements left unexploded;

- take part in the civil protection training where they work;

- take part in the maintenance of shelters in privately owned buildings and, if needed, in the arrangement of on-site storage areas;

- ensure their own personal protection equipment, sanitary kit, food and water reserve, as well as other commodities for the protection of their families;

- allow the access of forces and means of intervention to the site or on privately owned lands, in situations of civil emergency;

- allow the installation of alert equipment on privately owned buildings or buildings belonging to homeowners' associations, as the case may be, on a free of charge basis, as well as the access of authorized individuals for maintenance purposes;

- accept and perform evacuation from the affected or endangered areas, according to the measures decided and notified by the relevant authorities.

- require approvals and permits on civil protection, as provided by the law.

The above mentioned obligations also have to be fulfilled by foreign citizens who perform activities, reside in or transit the Romanian territory, as the case may be.

Citizens who are declared unable to work for medical reasons are exempted from the supply of services or participation in the performance of works, evacuation of goods and other similar activities that imply a physical effort, during the intervention to support civil protection forces.

### 1. Behaviour guidelines in case of fires in private residences

The rules below are stated in the form of messages that may be sent to people by modern means - radio, TV, internet - or through brochures, posters, flyers, etc.

#### a) Before the fire

- Keep matches and lighters out of the children's reach.
- Do not keep flammable products (alcohol, gas tanks, paper, clothes, etc.) close to sources of heat.
- Avoid, do not cause overheating of electrical devices. For instance, do not cover TV sets and equipment that heats.
- Look out for the candles. Put them off before leaving the room.
- Also look out for the ashes. They may contain coal for several days. If you want to keep them, put them in a non-flammable container.
- Never smoke in bed.
- Only use non-flammable ashtrays and wait for a few hours before emptying them into a bin that contains paper waste or into a trash bag.
- Do not leave the kitchen when heating butter or oil on a heated stove. Before leaving home, check whether all heated stoves are turned off.
- Remember the phone numbers of emergency services (firemen, police, ambulance).

#### b) During the fire

- Act calmly and reasonably, avoid panic.
- Ask for assistance and provide your address as accurately as possible.
- Turn off the gas and power supply.
- Use available means to fight fire.
- Never try to extinguish flammable liquid fire with water.
- When electrical equipment is on fire, disconnect it from the power source.



#### c) After the fire

- Follow the orders of the rescue team;
- Check your home;
- Help your neighbours and people in need (first aid kit).

## 2. Behaviour guidelines in case of forest fires

### a. Before the fire



**A forest fire in Zagubica, Serbia**

- Observe the instructions prohibiting the ignition of fire and smoking in forests, plantations, agricultural complexes, wooden homes, etc. in dry weather or violent wind.
- Keep the fence and surroundings (on a radius of at least 50 m) clean, with no bushes or dry wood, hay and flammable materials that foster fires.
- Keep matches and lighters away from children and warn them of the hazards of fire.
- Remember the phone numbers of firemen, civil protection or police services.
- Check your roof: missing or displaced tiles may allow the fire to spread, if a fire occurs nearby.
- Clean dry leaves and conifer needles from the roof and drains.
- Check the state of all openings: whether shutters are fully closed, whether the doors and windows are closed.



**A forest fire in Zagubica, Serbia**

### b. During the fire

#### b.1 If the fire has started

- Fight the fire starting from down.
- Use water or, if the fire burns quietly, hit it with branches or extinguish it with clothes.
- Alert emergency services (firemen, civil protection, police) and people living near the affected area.
- Open the gates of your property so as to facilitate the access of emergency services.
- Close all gas tanks located outside and move them far from the house.

#### b.2 If you are inside:



- Bring your garden hoses, they might be useful to extinguish residual fire, after the main fire has been extinguished.
- Seek for refuge inside.
- Close the shutters and windows, cover ventilation windows and fan exits with wet cloths.
- Try to avoid making air currents.
- Keep calm even though the smoke comes inside the house, despite the doors and windows being sealed.
- Do not leave the house until the rescue authorities or services order you to evacuate.

**A well protected house is the best shelter!**

#### b.3 If you are outside:



- Never come close to an area on fire.
- Move far away, in the opposite direction of the one the fire propagates to.
- If you are trapped in the middle of a fire, look out for your clothes (avoid synthetic fabrics).
- Look for a protection (a rock, a wall or an earth wave).
- If you have water, moisten your clothes and cover your mouth and nose with a wet cloth to protect yourself from the smoke and hot air.

#### b.4 If you are inside a car:



- Drive slowly.
- If you have time, look for a clean area and stop.
- If the fire front passes, do not leave the vehicle.
- Check whether the vehicle is closed.
- Always keep water in the vehicle, to moisten a cloth that you may use to cover your mouth and nose.

***A FIRE FRONT PASSES QUICKLY (60-90 seconds) AFTER A FIRE!***

#### 4. Guidelines for behaviour in case of natural disasters (floods).

##### a. Before the flood.



**Floods in Zagubica, Serbia, August 2018**  
**Source: Zagubica Town Hall**

- Inform yourself on the warning signs and evacuation procedures.
- In case of imminent flood risk, stop heating, gas and power supply devices.
- Move your furniture, electrical equipment and other personal items to upper floors.
- Place toxic substances, such as pesticides and insecticides in a safe place, so as to avoid pollution.

### b. During the flood

#### b.1 If you are inside:

- Keep calm.
- Warn your neighbours and help others, especially disabled persons, children and elderly people.
- Inform yourself on the hazard and its evolution. Listen to the radio
- Do not use the phone, so that the network does not become overloaded.
- Leave your house as soon as possible, when the persons in charge with emergency operations tell you so.
- Use the itinerary indicated by the persons in charge. Do not take shortcuts, you risk entering a trap or a dangerous place.
- Perform the required arrangements for domestic animals
- Only take with you what is absolutely needed (first aid kit, personal identification documents and medicines)



**Floods in Zagubica, Serbia, August 2018**

#### b.2 If you are in a car:

- Avoid driving on flooded roads, you risk being carried away by the current.
- If you are trapped in a flooded area and your car does not start, leave it, ask help for yourself and for your passengers.

**Floods in Zagubica, Serbia, August 2018**



### c. After the flood

- Help the wounded. Bring your first aid kit.
- Listen to the radio and follow the instructions of persons in charge with rescue operations.
- Pay attention before entering your home. Check the robustness of its structure (cracks in the walls, ceilings, broken windows and other dangerous crashes)
- Immediately pour about 2 litres of disinfectant in still waters.
- Do not drain all water at once (it may damage the foundations). Only remove a third of the amount of water every day.
- Do not live in a home where there is still water.
- Be careful not to electrocute yourself. Wear rubber boots when the water level is 5 cm above the pavement.
- Make sure that no power cables come into contact with water. In the flooded areas, immediately stop the power from the main switch, if not already stopped.
- If the pavement near the fuse panel is wet, place a blanket so as to stay on a dry area and use a dry tool to stop power.
- If you suspect that water for consumption may have been contaminated, use bottled water or boil the contaminated water for 5 minutes. You may also add two pieces of disinfectant for each litre of contaminated water. Leave it for 30 minutes, then you may consume it.
- Wash or sterilize pots and utensils. Use boiled water or a sterilization solution (about one teaspoonful of disinfectant in a sink full of water).
- Do not heat the home to a temperature of more than 40 degrees Celsius before all water from the flood has dried out.
- Take all dirty and wet materials and scrap out of the house.
- Wipe off the remaining mud and soil and throw away contaminated furniture, household appliances, clothes and linens.
- Clean and polish all surfaces and structures with disinfectant.



### 4. Guidelines for behaviour in case of destructive geological phenomena (earthquake)

Earthquakes are the most terrifying disasters. According to studies, a 7.0 degree earthquake on the Richter scale, with a degree of 45 seconds, has a seismic power about equal to 3 atomic bombs in Hiroshima.

#### a. Before the earthquake.

- Find out where and how to stop water, power and gas supply.
- Secure shelves and bookshelves against the walls.
- Place heavy objects as low as possible.

## JOINT STUDY EMERGENCY SITUATIONS RECAS-ZAGUBICA

- Survival kit including objects that allow **survival for 3-5 days**.



### b. During the earthquake

#### b.1.If you are inside.



- Don't hurry to go out.You are safer inside.
- Seek shelter under a door, a table, a desk, a bench and hold firmly to it to follow its movements.
- If no solid furniture is available, remain near an inside wall and protect your head and life.
- Stay away from fire sources, windows and balconies.
- Do not use elevators.

#### b.2.If you are outside:



- Move quickly to an open field.
- Stay away from structures, buildings, high walls, suspended cables, power cables and other structures likely to fall down.
- If the earthquake finds you next to a high building or a narrow street, find shelter under a porch or a door, so as to protect yourself from objects falling down.

### b.3 If you are inside a car:



- Stop the car and stay inside.
- Avoid bridges, viaducts and other structures that are likely to fail.

### b.4 If you are wounded



- Do not panic, stay calm.
- Call attention by all available means (use a whistle, knock against the walls, etc.)

### b.5 If you are not wounded



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- Stop any source of fire.
- Shut off all sources of heating.
- In case of damages, shut off power, water and gas supply.
- Do not use matches or lighters because of gas leakage risks.
- Listen to the radio and follow the instructions of persons in charge with rescue operations.
- Provide first aid to those who need it (first aid kit)
- Only use the phone if you are in danger. This is to avoid the overloading of the phone network, which is very important for rescue and medical services.
- Do not enter damaged buildings, even though you might think they are safe.
- In case of aftershocks, stay where you are and protect yourself.
- Distribute your reserves of food and potable water.

IMAGES OF THE ACTIVITIES  
CARRIED OUT WITHIN THE EUROPEAN PROJECT  
**“FIRE-FIGHTING AND MANAGEMENT OF  
EMERGENCY SITUATIONS RECAȘ-ŽAGUBICA”**



HELMET OF THE FIRE-FIGHTERS FIRST COMMANDER IN RECAȘ - 1880



MR. PAVEL TEODOR, MAYOR OF RECAȘ AND MR. PREDRAG IVKOVIC, DEPUTY MAYOR OF ŽAGUBICA



PRESS CONFERENCE LAUNCH OF INTERREG-IPA CBC ROMANIA-SERBIA EUROPEAN PROJECT  
SEPTEMBER 2017



VIDEOCONFERENCE WITHIN THE PROJECT



VIDEOCONFERENCE FROM SERBIA



THEMATIC GROUP IN ŽAGUBICA



RO-SRB VIDEOCONFERENCE



VIDEOCONFERENCE WITHIN THE EUROPEAN PROJECT



THEMATIC GROUP ORGANIZED IN RECAȘ WITHIN THE EUROPEAN PROJECT



THEMATIC GROUP ORGANIZED IN RECAȘ WITHIN THE EUROPEAN PROJECT



THEMATIC GROUP ORGANIZED WITHIN THE EUROPEAN PROJECT



THEMATIC GROUP ORGANIZED IN ŽAGUBICA, SERBIA, WITHIN THE EUROPEAN PROJECT



THEMATIC GROUP ORGANIZED IN ŽAGUBICA, SERBIA, WITHIN THE EUROPEAN PROJECT



VIDEOCONFERENCE ORGANIZED WITHIN THE EUROPEAN PROJECT



EXCHANGE OF EXPERIENCE BETWEEN RECAȘ AND ŽAGUBICA FIRE-FIGHTERS



JOINT TRAINING OF ROMANIAN AND SERBIAN FIRE-FIGHTERS



SCHOOL DISSEMINATION ON EMERGENCY SITUATIONS IN ŽAGUBICA WITHIN THE EUROPEAN PROJECT



GRADUATES OF THE FIRE-FIGHTING COURSE WITHIN THE EUROPEAN PROJECT



RECAŞ FIRE-FIGHTERS TRAINING



RECAŞ FIRE-FIGHTERS TRAINING



RECAȘ FIRE-FIGHTER AT TRAINING



RECAȘ FIRE-FIGHTERS TRAINING

## JOINT STUDY EMERGENCY SITUATIONS RECAȘ-ŽAGUBICA



THEMATIC GROUP ORGANIZED IN RECAȘ TO WRITE THE STUDY



VIDEOCONFERENCE ORGANIZED TO WRITE THE STUDY



THEMATIC GROUP ORGANIZED IN RECAȘ TO WRITE THE STUDY



PUBLIC DISSEMINATION ON EMERGENCY SITUATIONS



PUBLIC DISSEMINATION ON EMERGENCY SITUATIONS



PUBLIC DISSEMINATION ON EMERGENCY SITUATIONS



JOINT TRAINING OF ROMANIAN AND SERBIAN FIRE-FIGHTERS



JOINT TRAINING OF ROMANIAN AND SERBIAN FIRE-FIGHTERS



DELEGATION OF THE SERBIAN PARTNER AT THE LAUNCH OF THE FIRE-FIGHTING AND MANAGEMENT OF EMERGENCY SITUATIONS RECAȘ-ŽAGUBICA



FIRE FIGHTING COURSES COMPLETED ŽAGUBICA, SERBIA



SCHOOL DISSEMINATION IN ŽAGUBICA WITHIN THE EUROPEAN PROJECT



VIDEOCONFERENCE ORGANIZED AS STUDY BASIS



Meeting of the project team with Žagubica fire-fighters



Joint training of Romanian and Serbian fire-fighters



Meeting of the project team with Žagubica fire-fighters



Fire fighting courses in Žagubica within the European project



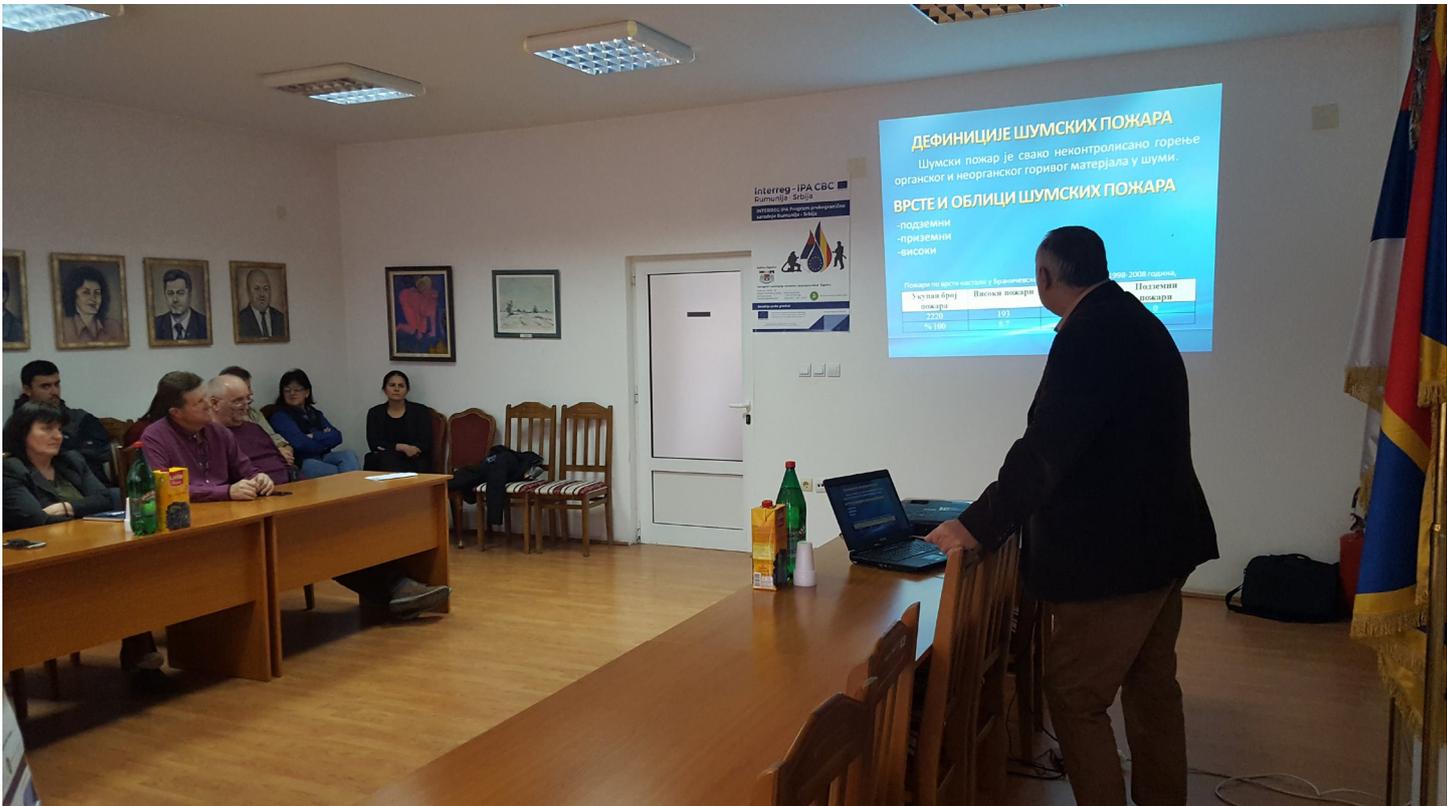
Images joint training of Rečas and Žagubica fire-fighters within the European project



Practical fighting courses in Žagubica within the European project



Joint training of Romanian and Serbian fire-fighters



Public institutions dissemination on emergency situations in Žagubica within the European project



Public and public institutions dissemination on emergency situations in Žagubica within the European project



Public institutions dissemination on emergency situations in Žagubica within the European project



Public institutions dissemination on emergency situations in Žagubica within the European project



Public institutions dissemination on emergency situations in Žagubica within the European project



Videoconference organized as study basis



JOINT TRAINING WITH RECAȘ-ŽAGUBICA FIRE-FIGHTERS



FIRE-FIGHTERS JOINT TRAINING GROUP PICTURE

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