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NATURAL HAZARDS VULNERABILITY IN BLAGOEVGRAD PROVINCE

Abstract: Blagoevgrad Province is located in the southwestern part of Bulgaria. The specific hydro-climatic conditions and the complex geological and tectonic development of the region give all the prerequisites for the emergence and development of different types unfavorable natural phenomena (natural hazards) in space and time. Floods, landslides, earthquakes and adverse climatic phenomena are a major factor in these phenomena. The territory of Blagoevgrad Province is vulnerable to varying degrees from each of them.

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Introduction

Blagoevgrad Province occupies the southwest part of the Republic of Bulgaria. It is located between Kyustendil, Sofia, Pazardzhik and Smolyan Provinces and state borders with Greece and Macedonia [Fig.1]. The province has a territory of 6,449.5 km² and a population of 312,831 [as of December 2015]. It is the third largest in Bulgaria after Burgas and Sofia Provinces and comprises 5.8% of the country's territory. Blagoevgrad Province includes the mountains, or parts of, Rila [Musala peak, 2925 m], Pirin [Vihren peak, 2914 m], the Rhodopes, Slavyanka, Belasitsa, Vlahina, Maleshevo, Ograzhden and Stargach Mountains. There are two major rivers — Struma River and Mesta River — with population concentrations along their valleys, which are also the main transport corridors.



Fig.1 Location of Blagoevgrad Province in Bulgaria

The complex physiographic position and complex geologic-geomorphological evolution of Blagoevgrad Province are a prerequisite for the emergence and development of various natural phenomena which will be discussed in more detail below.

Natural hazards profile in Blagoevgrad Province

Blagoevgrad Province is characterized by moderate risk for the development of dangerous natural phenomena [Fig.2]. In general, the territory of the province is vulnerable to the development of floods and landslides, and to a lesser extent to the emergence of different types of adverse meteorological events, and also, although to a much lesser extent and to earthquakes [Fig.3].

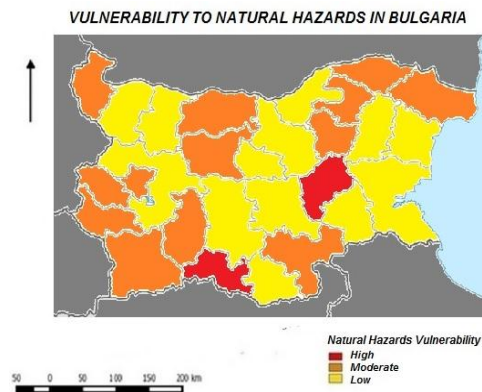


Fig.2 Blagoevgrad Province is characterized by moderate risk for the natural hazards development [Data: [6]]

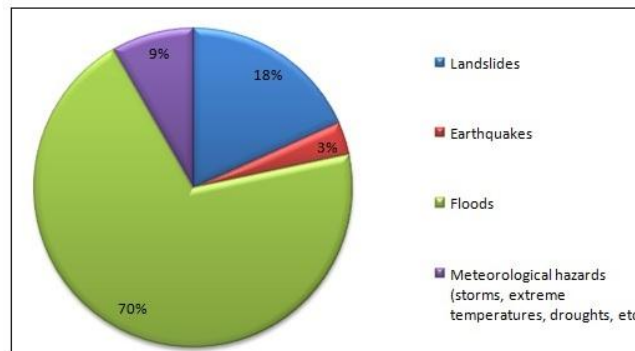


Fig.3 Natural hazards profile in Blagoevgrad Province for the period 2005-2015 [Data: [7]]

Flood Hazard

Floods are the most common type of natural disaster in the province [Fig.3], but the flood hazard has moderate value [Fig. 4]. On the territory of Blagoevgrad Province run two of the longest rivers in Bulgaria- Struma River [290 km on Bulgarian territory] and Mesta River [126 km on Bulgarian territory], which are fed by many mountain tributaries. The rivers in the province have mostly snow-rain regime with maximum runoff in the spring. This determines the highest risk of flooding during this season.

The southern part of the province is under the influence of continental- Mediterranean climate conditions and therefore often arise unfavorable hydrological phenomena during the autumn-winter period. Generally the most risky are the two major river arteries in the province, as well as some smaller tributaries as Lebnitsa River, Gradevska River, Sandanska Bistritsa River, etc. [Fig.5]

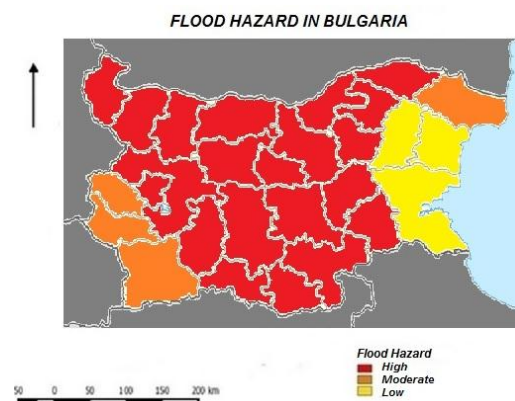


Fig.4 Blagoevgrad Province is characterized by moderate flood hazard [Data: [6]]

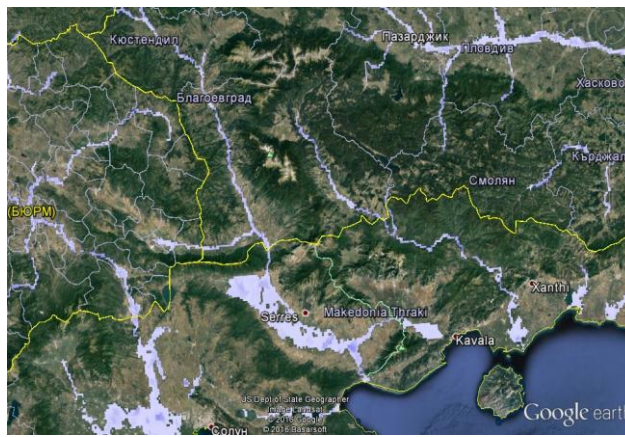


Fig.5 On the map are marked those parts of the province with the highest risk of flooding. [GIS data: [9]]

Landslide hazard

Blagoevgrad Province is characterized by high landslide hazard [Fig. 6]. The lands of the province are part of the Southwest landslide region of Bulgaria. Landslides are concentrated along the normal fault structures outlining the edges of mountain massifs. Here on the border with river valleys are developed well-defined alluvial cones, which annually manifest adverse gravitational processes [1]. Especially developed are these processes at the beginning of Kresna Gorge [near the village of Krupnik], also on the western edge of the Rhodope Mountain and the southern slopes of Pirin Mountain. Outside these areas landslide processes are underdeveloped.

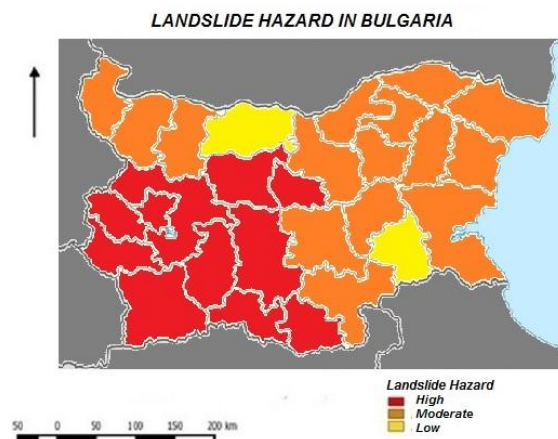


Fig.6 The landslide hazard on the territory of Blagoevgrad Province is high [Data: [6]]

Earthquake hazard

Earthquakes are the rarest natural hazard in the province, but the territory of Blagoevgrad Province is characterized by high seismic hazard - one of the highest in Bulgaria [Fig.7]. Seismic hazard in Blagoevgrad Province is due to the local and regional reasons. At first concern crustal geodynamic processes related to the ongoing collision between Neo Europe and Gondwana. They cause rapid rise of mountain massifs to the surrounding complex morphostructural passages. This raises moderate and strong seismic events in the border areas between these disparate morphostructures. Regional causes of the earthquake hazard in South-West Bulgaria due to compression Quaternary tectonic processes in the Aegean area. Part of the seismic energy released there headed north on Middle Struma and Middle Mesta morphostructural passages and there was a major seismic hazard [3].

In seismic term the Blagoevgrad Province is part of the Rila-Rhodope seismic zone, which includes the following three regions: Struma one [maximum expected magnitude 8 on Richter scale, intensity of 9th by MSK-64 scale in the epicentral area], Mesta one [maximum magnitude 6 on Richter scale, epicentral intensity around 8th degree by MSK-64 scale] and Western Rhodopes one [outside the

province] [maximum magnitude 6 on Richter scale, epicentral intensity around 8th degree by MSK-64 scale].

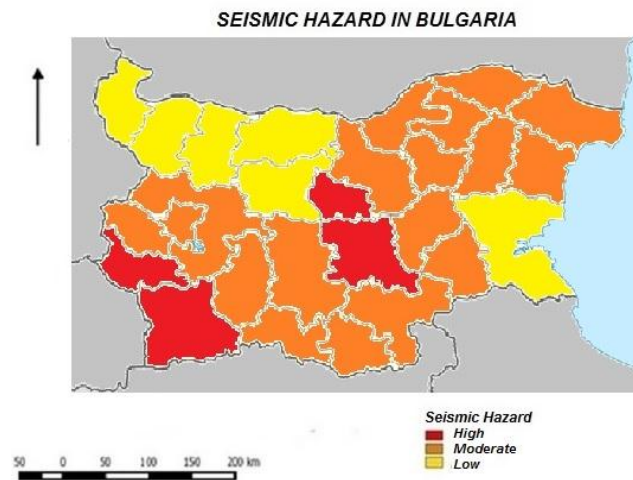


Fig.7 Earthquakes are rarest natural disaster in the province, but the seismic hazard is high [Data: [6]]

Struma seismic region is one of the most active in whole Europe. Not by chance was here in 1904 became the most powerful ever measured earthquake with magnitude 7.8 on the Richter scale. The catastrophic earthquake is associated with very active Krupnik fault. Strong seismic events are observed also along the Strumeshnitsa fault, located in the southwestern part of the province. [Fig.8]

Mesta seismic region spatially coincides with Mesta River Valley, along which there are various seismogenic fault structures. The strongest earthquake here was measured in 1910 with an intensity of 8th degree by MSK-64 scale.

The earthquakes can be a generator of other types of natural disasters - floods, mudflows, landslides, etc.

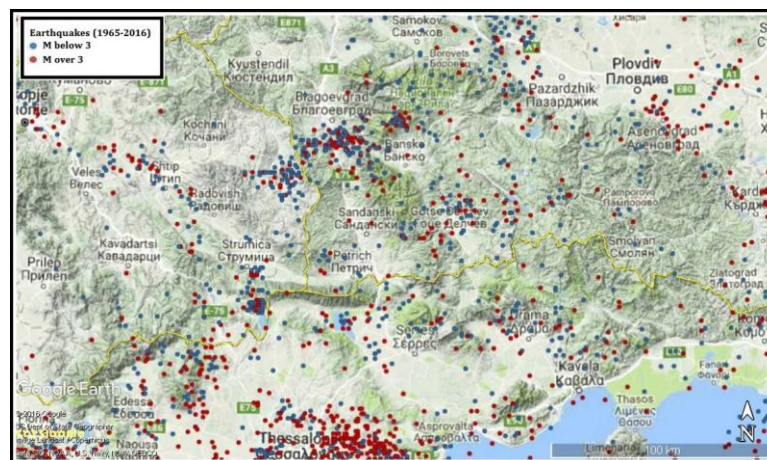


Fig.8 Most strong seismic events in Blagoevgrad Province [1965-2015] are associated with the activity of fault structures along the Middle Struma and Middle Mesta valleys. [Seismic data: [8]]

Adverse meteorological events

Given the specific climatic conditions of the territory of Blagoevgrad Province there is all prerequisites for the emergence and development of various types of adverse meteorological events. They are many types, but still leading place among them occupies drought [Fig.9] and extreme temperatures [Fig.10]. During the summer season in the forests of the area are frequent wild fires, which sometimes cause serious damage to state forests.

A smaller share is falling hail, torrential rainfall, snow storms, etc. These phenomena have a seasonal character and their appearance is strictly tied to certain period of the year. Trends towards increased frequency of these natural phenomena are becoming less favorable factor for the development of agriculture in the area. This is especially true for the southern (and also the most

fertile) parts of the province- the Sandanski- Petrich and Gotse Delchev plains. Here in recent years have seen a general trend towards drought and reduced rainfall.

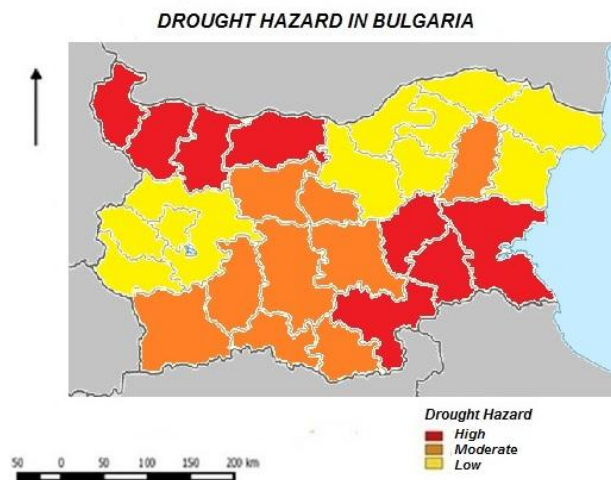


Fig.9 Blagoevgrad Province has moderate vulnerability to drought [Data: [6]]

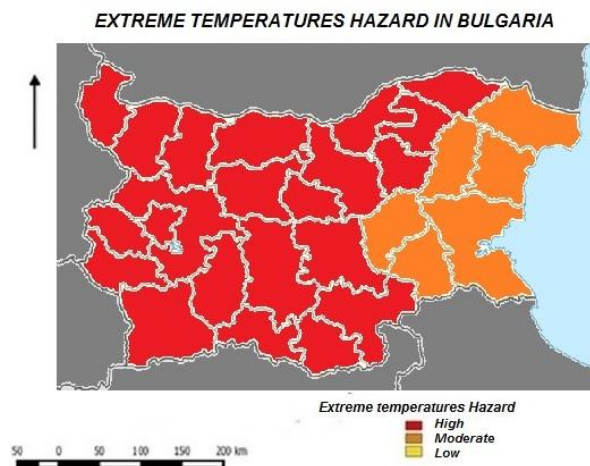


Fig.10 Extreme temperatures are one of the main natural hazard types [during summer] on the territory of Blagoevgrad Province [Data: [6]]

Conclusion

Blagoevgrad province is vulnerable to several types of natural disasters such as leading place among them occupy floods. In view of climate changes in the future unless the floods, will be increase the share of landslides and adverse climatic phenomena. Despite the low share of earthquakes the territory of Blagoevgrad Province is located in a highly seismic area, which is a prerequisite for the emergence of dangerous seismic phenomena in the future.

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