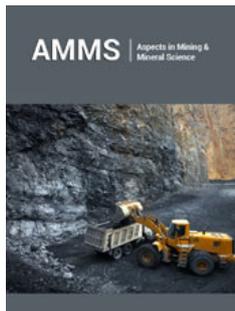


Global Climate Change Flooding of the Two Big Open-Pit Coal Mines in Serbia

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Abstract

Unprecedented precipitation and floods during the mid of May 2014, have caused damage of considerable proportions in Serbia. In the night between 14th and 15th of May, the swollen river Kolubara with its tributaries, has flooded the open pit coal mines Tamnava Zapadno polje and Veliki Crljeni. This is the greatest disaster that has struck the Mining basin of Kolubara since it was founded. This is a brief account of the event.

Keywords: Flood; Mining basin kolubara; Tamnava zapadno polje; Veliki crljeni

Introduction

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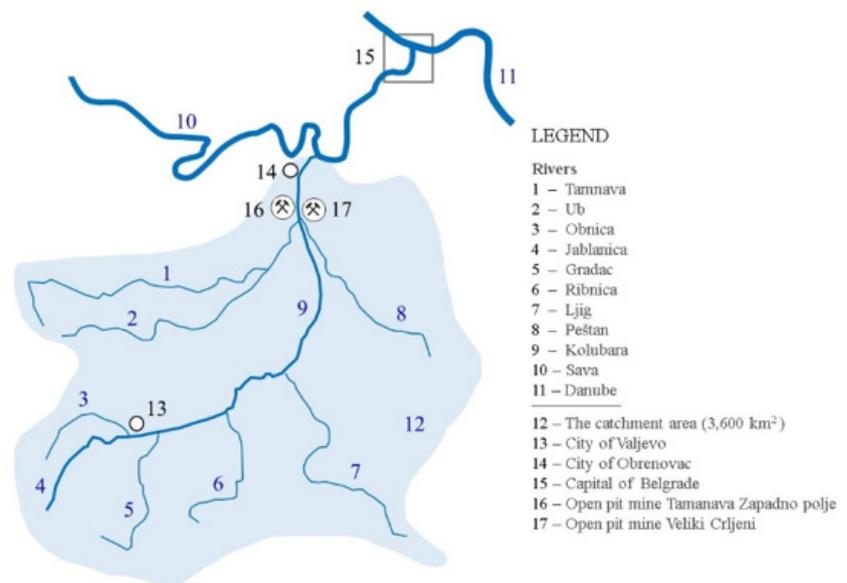


Figure 1: Sketch of the catchment area.

Large precipitation and floods are the result of the penetration of cold air across the Alps into the Mediterranean region, which led to the formation of a spatially deep cyclone that slowly shifted over the Balkan Peninsula on 13 of May. In the area of the basin of Kolubara River, it caused extreme precipitation, the rain fell steadily on 14th and 15th of May, the amount of rainfall was 170l/m² to 220l/m², in some places exceeding 300l/m². Before this, from 14th of April to 5th of May, the territory of Serbia was exposed to a wet period with precipitation levels in most places ranging between 120l/m² and 170l/m², so at the moment of heavy rainfall in May the soil was already saturated with water [1]. Extreme amounts of precipitation fell at the same time, which caused the Kolubara River to burst, and its tributaries, (Figure 1), the

overflow and piercing of protective embankments in several places along the river flow, the flooding of urban areas, agricultural areas, open pit coal mines Tamnava Zapadno polje and Veliki Crljeni in the Mining basin of Kolubara, destruction of livestock, demolition of houses, bridges, roads, occurrence of landslides, environmental degradation, etc. [1].

Flooding of the Open Pit Mines

Due to the overflow and demolition of protective embankments on the Kolubara River and the Vraničina and Peštan tributaries, upstream from the southern border of the open pit mine Tamnava Istočno polje, where the exploitation of coal was completed, there was an outflow and change of Kolubara flow. The river cut through the new riverbed and by breaking through the defensive

embankment that protected the Tamanavian surface coal mines from the great waters of Kolubara River, the open pit mine Tamnava Zapadno polje was flooded. In these circumstances, upstream of the mouth of the Peštan tributary into the Kolubar River, there was a slowdown and overflow of water, the destruction of the embankment and the pouring of water in the open pit mine Veliki Cljeni. About 187 million m³ of water burst into the Tamnava Zapadno polje depression of the open-pit, and in the depression of the open-pit Veliki Crljeni about 27.4 million m³ of water. The water completely covered five bucket-wheel excavators, bucket dredger, two spreaders, four bucket draglines, five self-propelled conveyors, 22 driving stations and 29.3km of conveyors, 10 transformer stations, nine distribution plants and 17 auxiliary machines (bulldozers, loading shovels, loaders, etc.) [1,2], (Figure 2).

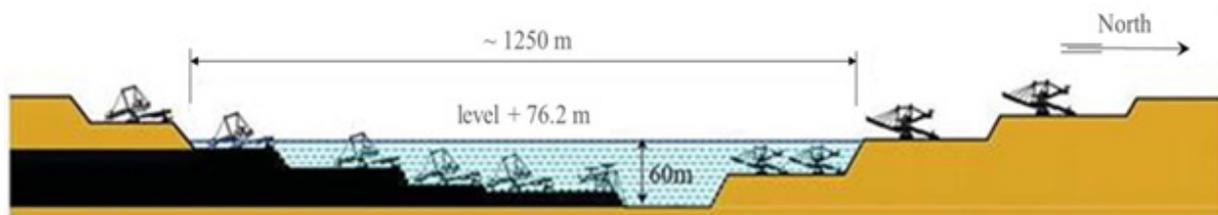


Figure 2: Sketch position of machines in the overflowed open pit mine Tamnava Zapadno polje (L Živković) [2].

Conclusion

According to the Report Floods in Serbia 2014 the UN, the EU, the World Bank, the Government of the Republic of Serbia [2], about 1.6 million people were affected by the floods in May in 38 municipalities and cities, about 32,000 people were evacuated from their homes, whereby about 25,000 were from Obrenovac only. In the 24 most affected municipalities, the total damage is 1.525 billion euros of which 0.885 billion is the value of destroyed material assets and 0.640 billion euros are losses in production. If all the affected municipalities are taken into account, the total flood damage is rising to 1.7 billion euros. The value of destroyed and damaged

mining and energy assets is 181.1 million euros, production losses amount to 305.8 million euros, and the total damage is 487.7 million euros [3]. Pumping the water out of Tamnava open pits lasted from May 2014 until the end of April 2015 [1].

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