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ANALYSIS OF FLOODS IN 2010 IN THE EASTERN SLOVAKIA

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ABSTRACT

The main cause of flood events that has occurred during May and early June 2010 in the Slovak republic and culminated in a historic flood situation was not only day of rich and intense rainfall, but high saturation of basins affected by the previous rainy season. The flood situation in May and June 2010 at river basins of the eastern Slovakia has brought great damage to property, such as landslides, damaged houses, gardens, cottages, damaged highways and local roads, bridges, cemeteries, flooded buildings, wells and mosquito strikes after floods. The paper is focused on the analysis of the flood situation in the spring of 2010 at the eastern Slovakia.

Keywords: floods, damages, eastern Slovakia.

Introduction

Spring and summer weather brings an increased risk of a range of extreme weather events, from heat to severe storms, often accompanied by torrential rain, storms, lightning or even hail or tornado. Intense rainfall can lead to the formation of local floods. Extensive regional flooding together with local torrential rains and storm are probably the biggest natural hazard associated with extreme summer precipitation. With relatively high certainty we now know that the ongoing climate change, extreme summer precipitation and hence flooding is even more amplified [1].

The main cause of flood events that occurred during May and early June 2010 and culminated in a historic flood events were not only long lasting and intense rainfall, but also high saturation of the basin, influenced by previous rainy period (Kyselova *et al.*, 2010). In Slovakia spring 2010 was a temperature just above the normal and had an average air temperature above the long-term average from the period 1951 to 1980 by 0.8 to 1.5 °C. Precipitation totals in Slovakia were very high, averaging about 200 mm (from 203 stations), it is about 300% of the long-term average period 1901-1990 (hence record since at least 1881) (Pecho *et al.*, 2010).

Flood situation

Eastern Slovakia was hit by the floods from mid May 2010. Upper sub-basins of Hornád river and its tributaries have been affected by the floods with moderate significance, while the middle and lower sub-basin have been significantly affected, as well as tributaries in the south-east of Slovakia, with disastrous consequences. In early June, extreme precipitation finally hit supersaturated water basins and caused flooding in many parts with flows of return periods of 50 to 100 (Simonová *et al.*, 2010). Courses of water levels (Zeleňáková and Gaňová, 2011) at river stations in the river basin Bodrog and Hornád for May and June are shown in Figures 1 - 4. The data were provided from Slovak Water Management Enterprise, state company, branch office Košice.

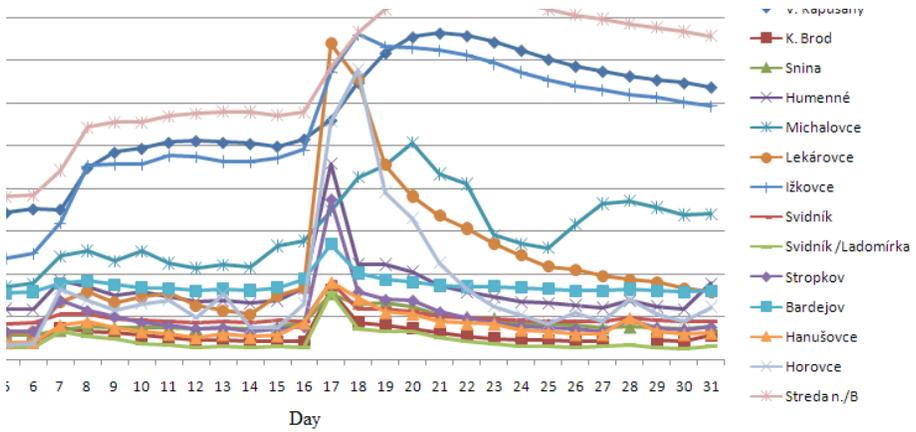


Figure 1 Courses of water levels at river stations in the river basin Bodrog in May 2010

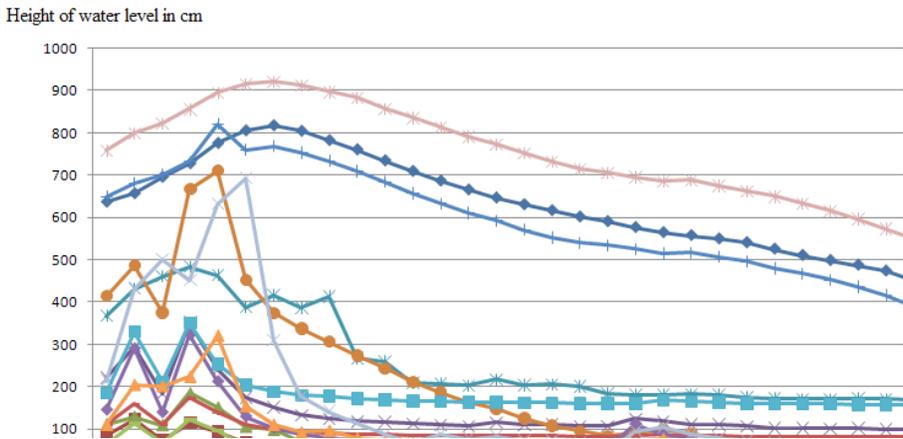


Figure 2 Courses of water levels at river stations in the river basin Bodrog in June 2010

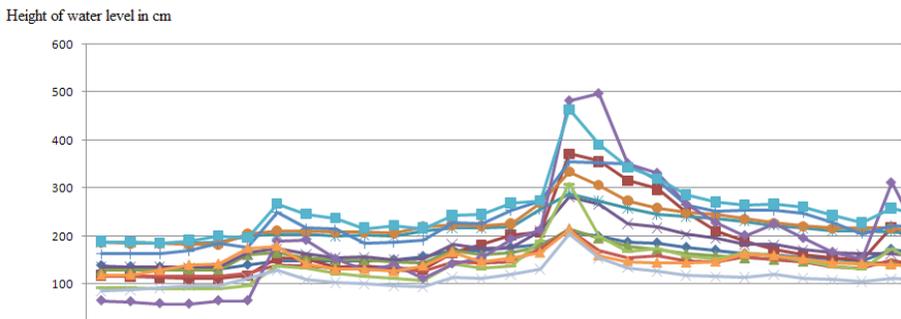


Figure 3 Courses of water levels at river stations in the basin Hornád in May 2010

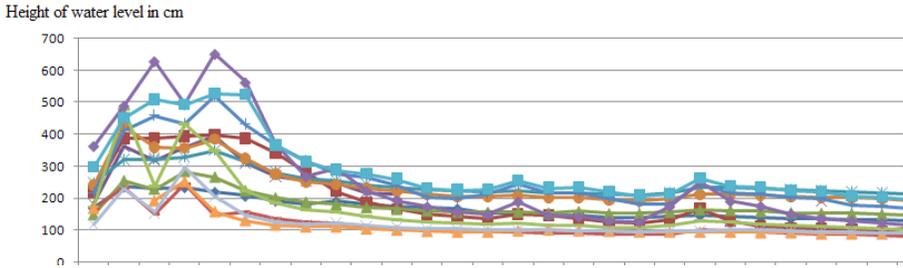


Figure 4 Courses of water levels at river stations in the basin Hornád in June 2010

It is possible to see the course of floods from Figures 1 to 4 in separate river stations during the flood period in May and June 2010.

Figure 5 presents number of flood days during period 1990-2011 in Slovakia in comparison with number of flood days in eastern Slovakia according the data of Slovak Hydrometeorological Institute.

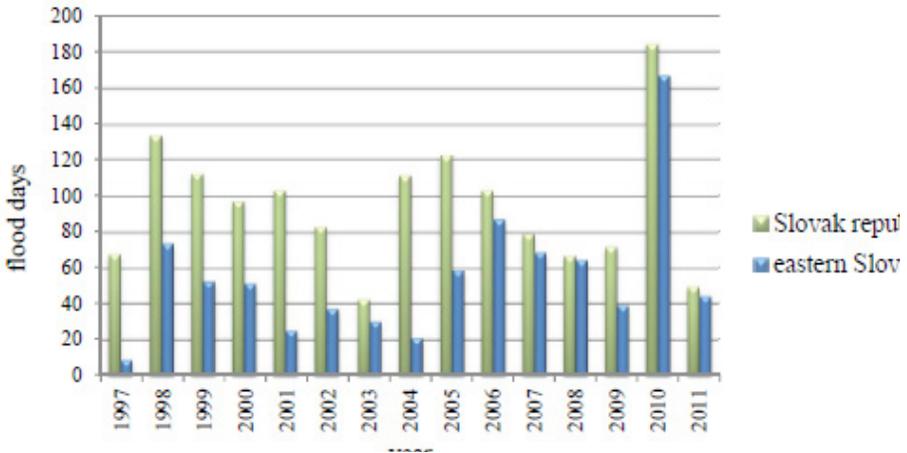


Figure 5 Number of flood days during the period 1990-2011

The floods in 2010 brought for region of eastern Slovakia in short time many extended floods with disastrous consequences with the high costs (Figure 6).

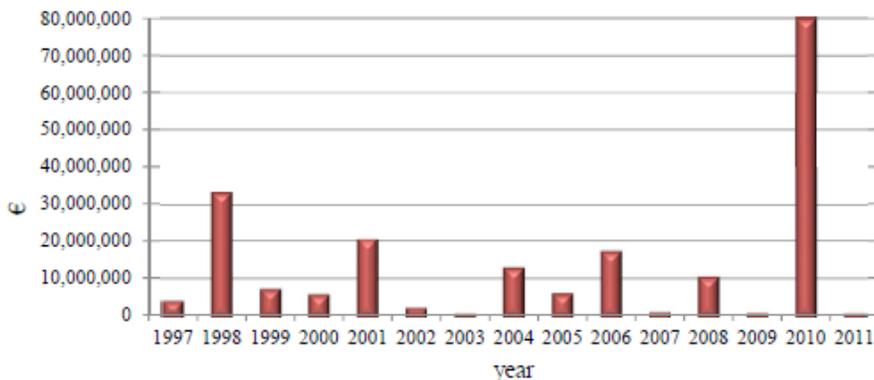


Figure 6 Flood damage during the period 1997-2011 (Zeleňáková, 2011)

Figure 6 presents the costs of flood damages at property of Slovak Water Management Enterprise, s.c. branch office Košice in eastern Slovakia during period 1997-2010. As is shown in figure 6 a downward trend exists in flood damage (without extreme year 2010), it can be causes of the construction of flood protection in the study area.

Conclusion

Flood situation in May and June 2010 on the flows of eastern Slovakia has brought great damages. After intense rains 300,000 hectares of agricultural land were flooded, this is 15 percent of the total arable soil. Farmers estimated that rains damaged 150,000 hectares. Damages in agriculture exceeded 100 million euro in whole Slovakia. Damages on forests in Slovakia were about 5,7 million euro, where repair of forest road network required investment of € 3,250,000 and another investment of 600 thousand euro. The government calculated the total damage at approximately 650 million euro. This damage represents 250 million euro to government property, and citizens quantify damage to 325.8 million euro and the municipalities for € 51,2 million.

For flood mitigation of damage to property of individuals was released 25 million euro from the state budget. Nearly 5,75 million euro was used for an immediate solution to repair infrastructure of state companies in the water and forestry industry.

Acknowledgments

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Bibliography

- Kyselová, D., Hrušková, K., Slivka, M., Jarošová, M., Borsányi, P. (2010) - *Povodňová situácia v povodiach Hrona, Ipla a Slanej, máj- jún 2010*. Banská Bystrica. Slovak Hydrometeorological Institute. Júl 2010. [online]. http://www.shmu.sk/File/Povodnova_situacia_na_tokoch_stredneho_Slovenska_v_maji_a_juni_2010.pdf
- Pecho, J., Faško, P., Lapin, M., Kajaba, P., Mikulová, K., Šťastný, P. (2010) - *Extrémne atmosférické zrážky na jar a na začiatku leta 2010 na Slovensku*. Bratislava. Slovak Hydrometeorological Institute. Climatology division.

- Simonová, D., Holubecká, M., Jarošová, M., Smrtník, M. (2010) - *Povodňová situácia ba východnom Slovensku v máji a júni 2010*. Košice. Máj - jún 2010. [online]. http://www.shmu.sk/File/Povodnova_situacia_na_tokoch_vychodneho_Slovenska_v_maji_a_juni_2010.pdf
- Zeleňáková, M., Gaňová, L. (2011) - Povodne na východnom Slovensku - máj, jún In: *Woda i surowce odnawialne a ich oddziaływanie na srodowisko naturalne*. Brzozow: Muzeum regionalne im. Adana Fastnachta w Brzozowie, p. 121-136.
- Zeleňáková M. (2011) - Flood risk assessment and management in Slovak republic, e-GFOS, 2(3), p. 113-119.