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# Natural hazards in Slovene karst areas: Flood risk areas in the Upper Pivka valley

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An overview of exceptional natural processes or natural hazards from the human perspective in Slovene karst areas is made. Some types of natural hazards are typical for karst due to the process of karstification and resulting geomorphological and hydrological characteristics of karst landscapes (presence of voids within the rock, absence of superficial flow and presence of specific karst groundwater flow system), while the others occur evenly in all types of landscapes. However, their impact is different in karst as it is in the non-karst landscapes. Examples of particular phenomenon or events, their frequency of occurrence, expansion and caused damage are presented. Special emphasis is laid on high waters in karst poljes, shallow karst areas or contact karst, where flooding emerges due to the raise of karst groundwater table as a consequence of intensive precipitation or snowmelt. Flooding in karst can also appear due to insufficient swallow capacities of the underground channels, which are not capable of conducting surpluses of inflowing water. In opposite to flash floods, the karst floods are more predictable, since they usually occur in the same areas to the same elevation and in the same season of the year. Inhabitants are easily adapted to this phenomenon, setting the settlements and other important infrastructure on elevations above the highest recorded water level. Usually such flooding does not pose serious threat and causes no serious flood damage, except during extreme events, as it was in the case of the autumn 2000 floods.

Case study of the Upper Pivka valley, where floods usually cover around 6.6 $km^2$, is treated and explained. During the intensive rain period from September to November 2000, the groundwater table rose for about 20-35 m above the usual level, causing flooding also in the areas, where they have never been recorded before. Precise mapping of the flooded area extents in the discussed area and the height of the water levels was performed. With the help of the photographic documentation, *Golden software* and *ArsGis 9.1* program tools the surfaces and the volumes of the particular closed flooded areas were calculated and digitized on the map. The continuous surface of the flood extended to 59 ha. Beside the groundwater table rise, a surface stream, which emerged in the ancient Pivka riverbed, additionally contributed to the flooding in the area, especially in the Bač settlement. Though the residents are aware of flood risk and adapted to the floods with some technical provisions (e.g. lifting roads above the usually flooded areas), the long-term spatial plan neglects mapped flood risk areas, but it allows new buildings to be set up. In this manner the need to comprehensive knowledge of the natural hazards problematic is emphasised. A stress is laid also to the well considered land use planning, which is the basis for the reduction or even prevention of negative consequences of such events.