



## **Analysis of possible expansion of flood hazardous area induced by land subsidence: a case study at the Kujukuri Plain in Chiba Prefecture, Japan**

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Land subsidence has widely occurred at many sites in Japan because of industrial withdrawals of groundwater. The Kujukuri Plain, Chiba Prefecture, Japan, is one of the heavy subsidence areas with the maximum value of accumulated subsidence of 96 cm at Mobara City during the period from 1969 to 2005. We have evaluated the impact of land subsidence on the change of lowland distribution by means of the following procedure. Firstly, we made detailed DEM based on elevation points in old topographic maps (1/2,500) constructed in 1974. Secondly, we surveyed the long-term spatio-temporal changes of subsidence by integrating the past leveling records. Thirdly, we predicted the possible temporal change of ground level based on the trend of subsidence. Finally, we evaluated the impact of subsidence on the flood risk, i.e., temporal change of possible flood-hazardous area. We assumed that the place at an altitude below 6 m is possible flood-hazardous area since wave height of tsunami at the Genroku Earthquake in 1703 was at around 4 to 6 meters at the Kujukuri Plain. In the case of one study area near Mobara City, the hypsographic curve showed that the possible flood-hazardous area increased only by 1.8% during the past 31 years (from 0.8% in 1974 to 2.6% in 2005) while that may increase by 27.8% in the next 90 years (from 2.6% in 2005 to 30.4% in 2095). The results indicate that possible flood-hazardous area does not necessarily expand in proportion to the elapsed duration but may expand nonlinearly even though our assumption is simple linear extrapolation of the recent subsidence rate. Therefore, quantitative evaluation of the impact of land subsidence on natural environment using this method is important and it can contribute

to the planning for sustainable industrial activities including groundwater withdrawal.