

Land subsidence and groundwater extraction in Bandung Basin, Indonesia

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Abstract The Bandung Basin is a large intra-montane basin surrounded by volcanic highlands, in western Java, Indonesia, inhabited by more than seven million people. The basin, an area of about 2300 km², is a highland plateau at approximately 650–700 m above sea level and is surrounded by up to 2400 m high Late Tertiary and Quaternary volcanic terrain. Based on the results of six GPS surveys conducted in February 2000, November 2001, July 2002, June 2003, June 2005, and August 2008 it was shown that several locations in the Bandung Basin have experienced land subsidence, with an average rate of about –7.6 cm/year and can go up to about –23 cm/year in certain locations. A similar rate of subsidence was also detected by the InSAR (Interferometric Synthetic Aperture Radar) technique between June 2006 and March 2007. A hypothesis has been proposed by several studies that land subsidence observed in several locations in the Bandung Basin has been caused by excessive groundwater extraction. It is found that there is a strong correlation between the rates of groundwater level lowering with the GPS-derived rates of land subsidence in several locations in Bandung Basin, with a correlation coefficient of up to about 0.92. The GPS and InSAR results in this study detected significant subsidence in the textile industry area, where very large volumes of groundwater are usually extracted. Extensive conversion of prime agricultural areas into residential and industrial areas, and also significant disturbance to the main ecological functions of the upland around Bandung Basin, also significantly disturb the groundwater recharging system in the basin; which in turn intensify subsidence problems there.

Key words Bandung; land subsidence; groundwater; GPS; InSAR