

### Integration of geodetic observation results for assessment of land subsidence hazard risk in urban areas of Indonesia

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Several large urban areas in Indonesia, i.e. Jakarta, Bandung and Semarang, have experienced land subsidence. These urban land subsidences are mainly caused by the combination of excessive groundwater extraction, natural consolidation of alluvium soil, and load of constructions (i.e. settlement of high compressibility soil). The impact of land subsidence can be already seen in several forms, such as cracking of buildings and infrastructure, the wider expansion of (coastal) flooding areas, and increased inland sea water intrusion. It also badly influence the quality of living environment and life in the affected areas.

Land subsidence in Jakarta has been studied using leveling surveys, GPS surveys, and InSAR techniques (Abidin et al. 2011). The results obtained from these technique over the period between 1982 and 2011 show that observed subsidence rates in Jakarta are about 1 to 15 cm/year, and can reach up to 20-28 cm/year at certain location and certain period. In Bandung basin, land subsidence phenomenon has been studied using GPS surveys and InSAR methods (Abidin et al. 2013). Based on these methods, it was found that during the period between 2000 and 2011, several locations in the Bandung basin have experienced subsidence, with an average rate of about -8 cm/year and can reach up to about -23 cm/year. In Semarang, land subsidence has been studied using Levelling surveys, GPS surveys, Microgravity surveys and InSAR technique (Abidin et al. 2012).. Based on the estimation from those measurement methods, land subsidence with rates of up to about 19 cm/year were observed during the period of 1999 up to 2011. The observed land subsidence rates in Jakarta, Bandung and Semarang in general have spatial and temporal variations.

Results from various geodetic observation methods can give a better picture on the magnitudes and rates of land subsidence, and its variation both in spatial and temporal domain. Integration of those results however, can not always be performed in an ideal manner, since each geodetic method has its own operational strengths and weaknesses in large urban environment.

#### References

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