



On Assessment and Estimation of Potential Losses due to Land Subsidence in Urban Areas of Indonesia

Hasanuddin Z. Abidin, Heri Andreas, Irwan Gumilar, and Teguh P. Sidiq

Institute of Technology Bandung, Faculty of Earth Science and Technology, Geodesy Research Group, Bandung, Indonesia
(hzabidin@gd.itb.ac.id)

Land subsidence is natural-anthropogenic hazard affecting several large urban areas in Indonesia, i.e. Jakarta, Bandung and Semarang. Geodetic based results from various techniques (e.g. Leveling, GPS and InSAR) show that land subsidence rates in all three cities generally have spatial and temporal variations, and their magnitude is in average about 5-10 cm/year. The impacts of subsidence in those cities can be seen in the field in various forms such as cracking of permanent constructions and roads, tilting of houses and buildings, 'sinking' of houses and buildings, changes in river canal and drain flow systems, wider expansion of coastal and/or inland flooding areas, and increased inland sea water intrusion. These impacts can be categorized into infrastructure, environmental, economic, and social impacts. The potential losses due to land subsidence in urban areas are actually quite significant. Related infrastructural, social and environmental costs due to direct and indirect impacts of land subsidence are economically quite significant, and can not be underestimated in sustainable urban development. The planning, development and maintenance costs of building and infrastructures in the affected areas are usually much higher than the normal situation. The collateral impact of coastal subsidence in Jakarta and Semarang, in the form of coastal flooding during high tides is also quite damaging. This repeated coastal flooding in several areas along the coast will deteriorate the structure and function of building and infrastructures, badly influences the quality of the living environment and life (e.g. health and sanitation condition), and also disrupts economic and social activities in the affected areas. As in the case of Bandung, inland subsidence also has a quite significant impact on inland flooding phenomena, since it will theoretically lead to expanded coverage and deeper water depth of flooded (inundated) areas. Since the direct and indirect impacts of subsidence have also relation among each other, the accurate quantification of the potential losses caused by land subsidence in urban areas is not an easy task to accomplish. The direct losses can be easier to estimate than the indirect losses. For example, the direct losses due to land subsidence in Bandung was estimated to be at least 180 Million USD; but the indirect losses is still unknown.