

ABSTRACT

Land use change in North Semarang Sub-district, especially the conversion of open land and agriculture to built-up land, significantly contributes to the acceleration of land subsidence. This study aims to analyze how land use change affects the rate of land subsidence and its implications for spatial planning. Spatial-based quantitative methods were applied by processing Sentinel-1A images with Differential Interferometry Synthetic Aperture Radar (DInSAR) technique using SNAP software, and mapping land use change with QGIS from 2010 to 2024. The results show a progressive increase in the rate of land subsidence: from 5.1 cm/year (2016-2018), increasing to 7.4 cm/year (2019-2021), and reaching 9.3 cm/year (2022-2024). Areas with the highest level of vulnerability include Bandarharjo, Tanjungmas, and Dadapsari villages. Spatial overlay analysis showed that zones with intense development coincided with severe land subsidence, identifying high vulnerability areas of approximately 401.37 hectares or 35.35% of the total sub-district area. In addition, 326.74 hectares of this vulnerable zone are located within areas designated for development in the city's spatial plan (RTRW). This overlap indicates the importance of continuously updating spatial references to accommodate evolving geophysical conditions, as identified through recent analysis. Such conditions may increase the risk of tidal flooding and infrastructure damage, thereby presenting challenges to sustainable urban planning and physical development resilience.

Keywords: *Environmental Impact, Geographic Information System (GIS), Land Use Change, Land Subsidence, North Semarang Sub-District.*