



Land Use Change Impact on Carbon Sequestration in the Limboto Watershed, Gorontalo

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Abstract. The Limboto Watershed is one of the watersheds in Indonesia that is facing severe pressure due to rapid and uncontrolled land-use changes. Although various studies have examined the impact of land-use changes on carbon storage, most have focused on the national or global scale, thus failing to capture complex local dynamics such as those in the Limboto watershed. This study aims to analyze the impact of land-use changes on carbon sequestration in the Limboto watershed using a spatial approach. Temporal integration of remote sensing data with the InVEST (Integrated Valuation of Ecosystem Services and Trade-offs) model is needed to predict changes in aboveground carbon stocks. The results show that the conversion of secondary forests, wetlands, and riparian vegetation to agricultural and residential areas has caused a significant decline in areas with high carbon sequestration potential. Between 2018 and 2023, carbon stocks decreased by approximately 1,181,419.06 megagrams (Mg) of carbon, equivalent to approximately 8.2% of the previous total stock. This carbon stock loss is equivalent to the potential release of approximately 4.34 million Mg of CO₂ into the atmosphere. This suggests that land-use changes have a significant impact on the ecological and climatic conditions in the region. The spatial approach used in this study provides a scientific basis for zoning strategies related to vegetation restoration and land-use regulations. These findings are expected to support the integration of adaptive approaches in the sustainable management of Lake Limboto. Synergistic efforts between government agencies, local communities, and stakeholders are crucial for developing sustainable planning based on spatial and ecosystem data.

Keywords: Type your keywords here; Saparated by semicolons; Limboto watershed; Carbon Stock Carbon stock; InVEST; land use/cover