THE FATE OF TROPICAL FOREST IN CENTRAL SUMATRA: MAPPING, MODELING, AND SCENARIOS ANALYSIS USING PALSAR DATA

Rajesh Bahadur Thapa, Masanobu Shimada, Manabu Watanabe, Takeshi Motohka, and Tomohiro Shiraishi

Earth Observation Research Center
Japan Aerospace Exploration Agency (JAXA)
2-1-1 Sengen, Tsukuba City, Ibaraki 305-8505, Japan
Tel: +81-50-3362-7444; Email: rajesh.thapa@jaxa.jp

Abstract: The processes that drive changes in our terrestrial ecosystem are a complex mix of social, governance, and ecological processes. Understanding these complex processes is essential for mitigating some of the global-environmental changes including tropical deforestation. Availability of SAR data and geographic techniques has made possible to trace past events even in cloudy tropical region and examine spatiotemporal patterns of future environmental consequences. In this research, we aim to monitor the spatial pattern of tropical forest and estimate the forest loss using PALSAR data and a spatially explicit model. Riau Province located in central Sumatra is selected as a study area. Time series land cover maps were prepared for 2007, 2008, 2009, and 2010 using 25 meters spacing PALSAR mosaic data. We used Markov Chain, Bayesian, and fuzzy approaches to calibrate and validate the spatial model and predict the future landscape spatial patterns. We found that a large part of the forest (1 million ha) was deforested during the years 2007-2010. Using the model, business as usual, regrowth and two governance scenarios were examined for the next two decades where the spatial patterns of the deforestation between the scenarios are apparent. If the historical trend continues, the forest cover will be consistently disappeared leaving very few small forest patches by 2030. The deforestation pattern extends over adjacent and environmentally sensitive areas such as conservation forest in the peat swamp areas in the north-eastern part and dry-land areas in the south-western parts in the province. However, one of the governance scenarios has produced a balanced forest spatial pattern in the province as compared to the other scenarios. If this scenario is implemented fairly, most of the sub-regions will likely have a considerable amount of forest cover by the end of 2030.

Keywords: L-band SAR, MRV, REDD+, land cover, deforestation