# Forest Degradation Monitoring with Vegetation Indices as an Indicator: a Case of Kapuas Hulu, West Kalimantan, Indonesia

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**Abstract:** Various efforts to reduce carbon emission have been made tremendously as a response to climate change issue. An international mechanism named REDD+ is one the efforts in which the focus is on reducing the emissions of greenhouse gases (GHG) from deforestation (D) and forest degradation (FD). This scheme also requires a system in which all activities that are being undertaken should be in a measurable, reportable, and verifiable manner or best known as MRV. However, compared to deforestation, measuring forest degradation is more complex because the process of degradation itself is almost undetectable and the definition of what is considered degraded forest still remains unclear. Based on the situation, this study focuses on how to measure the process of degradation using remote sensing (RS) based monitoring approach. A time series of Landsat Enhanced Thematic Mapper (ETM+) / Thematic Mapper (TM) imageries in year 1990, 2000, 2005 and 2010 were used for the analysis.

The study area is in the forest of Kapuas Hulu district, in the province of West Kalimantan, Indonesia in which dominant forest cover suffered from logging activities, forest fires and local livelihood activities. Data preprocessing method such as radiometric and atmospheric correction were also applied to remove haze and other disturbances and generate earth surface reflectance. The method applied is using the arithmetic combinations of several spectral bands known that include NDVI, MSAVI, EVI and other common band ratios that are used as an indicator to measure the forest degradation. Characteristics of undisturbed and logged over forests were analyzed using spectral signature plots. The basic idea is to see and detect the changes of vegetation cover between the time series data using reflected spectral response. The process of degradation itself is measured in a decrease of these vegetation indices values which is done through the analysis of the imagery. Through field survey data which is based on the stratified random sampling, the method is validated to make sure it is applicable. The expected result from this research is that with the method of using the best combination of vegetation indices as an indicator, forest degradation can be measured and monitored with the aid of satellite imagery.