# Evaluation of Rapideye Images in Estimating Aboveground Biomass of Peat Swamp Forests in Central Kalimantan

Edwine Setia Purnama[1], Lutz Fehrmann[2], Hans Fuchs[3], Paul Magdon[4], Christoph Kleinn[5]

[1] University of Goettingen, Chair of Forest Inventory and Remote Sensing, Germany

[2] Georg-August-Universität Göttingen, Chair of Forest Inventory and Remote Sensing, Germany

[3] Georg-August-Universität Göttingen, Chair of Forest Inventory and Remote Sensing, Germany

[4] Georg-August-Universität Göttingen, Chair of Forest Inventory and Remote Sensing, Germany

[5] University of Goettingen, Chair of Forest Inventory and Remote Sensing, Germany

## Abstract

Peat swamp forest plays a significant role in global climate change. This ecosystem serves as carbon storage and is a potential emitter of greenhouse gases. While the largest carbon stocks are in the peat there, peatlands of Southeast Asia store approximately estimated 58 Gt carbon in the form of biomass. The share of GHG emission from peat forest land is considerable in Indonesia: emissions from peat decomposition and forest fire during 2000–2014 in Indonesia shared on average an estimated $0.000297$ Gt $CO_2$ eq $(48.2\%)$ and $0.000216$ Gt $CO_2$ eq $(30.2\%)$ to the total emission from forestry sector and other land uses within the country, respectively.

Our study was conducted at the natural laboratory of peat swamp forest, which is part of Sebangau National Park. Sebangau National Park itself contributed to the greenhouse gases reduction of an estimated $31.797$ tons $CO_2e$ annually in the time period from 2013 to 2016. The main objective of the study was to evaluate the potential of RapidEye satellite imagery to support and/or improve the estimation of aboveground biomass in this particular peat swamp forest.

A forest inventory was implemented to record individual tree variables, including diameter at breast height (bhd) from 5 cm upwards. The individual tree aboveground biomass was predicted from allometric models as proposed by Brown (1997), Chave (2005) and Manuri (2014).

The remote sensing data used in our study was Level 3A RapidEye imagery with a spatial resolution of 5 m and with five spectral bands including Red Edge and Near Infra Red, which is beneficial for vegetation related assessments. Vegetation indices were derived from the original spectral bands. The model relationship between forest inventory variables and remotely sensed variables was performed at plot level. Spatial probability simulation was performed to analyse the plot positional effect during the overlay of remote sensing data to forest inventory plot, to evaluate the challenge of co-registration. The study showed some potential for the use of RapidEye vegetation indices when estimating aboveground biomass.

**Keywords:** Aboveground biomass, Forest inventory, Peat swamp forest, RapidEye

**Contact Address:** Edwine Setia Purnama, University of Goettingen, Chair of Forest Inventory and Remote Sensing, Buesgenweg 5, 37077 Goettingen, Germany, e-mail: epurnam@gwdg.de