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## Changes in Carbon Stock as Affected by Land Use Change in West Aceh, Sumatra

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### Abstract

High world market prices for biofuels and accessibility of the region after 25 years of conflict foster the conversion of peatland areas in Aceh – traditionally under ‘jungle rubber’ – into oil palm plantations. Apart from clear-cutting and burning this land use change includes drainage of the organic peat soils. Exposed to aerobic conditions, the rate of soil organic matter decomposition is sharply accelerated. Given the high organic matter contents of peat soil, amounts of emitted CO<sub>2</sub> increased during the last years due to similar processes in Kalimantan and put Indonesia on the third place in the global CO<sub>2</sub> emission ranking.

Embedded in the EU-funded Rebuilding Green Infrastructure (ReGrIn) project, this study is conducted to quantify carbon pools of peat soils under different land uses (rubber, clear-cut, oil palm) in chronosequences (false time series). Data will be used to parametrise and calibrate a crop model (WaNuLCAS) for two different land uses: rubber and oil palm. Sampling plots will be established on sites representing land use chronosequences from rubber forests to oil palm plantations, including both drained and undrained rubber sites. Soil samples are collected along transects using a peat sampler. Carbon contents will be analysed using Walkley and Black and loss on ignition methods. Peat thickness, bulk density and soil respiration rates are also determined to obtain plot carbon balances.

Allometric equations are used to determine above-ground biomass. Root-shoot ratios for rubber and oil palm from literature are used to estimate belowground biomass. Changes in carbon stocks due to land use change on plot level will be aggregated using existing land use classifications based on satellite images from 1990–2006. The conversion area of rubber to oil palm will be quantified using GIS.

Expected results are the determination of amounts of carbon stored in the soil and vegetation on a plot level under different land uses. Combined with spatial analysis, the contribution of land use conversion on peat soils from rubber to oil palm will be estimated on a landscape level. WaNuLCAS will be used to test potentially more environmentally friendly scenarios.

**Keywords:** Jungle rubber, land use chronosequence, oil palm, peat soils

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