Land-use change within the western Amazon region: Analysing spatial-temporal variations on forest structure with remote sensing techniques

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Abstract

Human population growth, along with the increase of global demand for raw materials and agricultural commodities has historically impacted the global tropics. In the western Amazonian region, notably the market demand for Brazil-nut and later the Seringa latex (destined to rubber production) have, during the second half of the XX century, fueled large migration fluxes towards these remote and still sparsely populated forest areas. Currently, different vectors of occupation and land-use change exist and vary in terms of type and intensity across the different countries of the region. In this study, we analyse the trinational border shared by Brazil, Bolivia and Peru, which constitutes a great example of how widely those scenarios might vary across a relatively narrow geographic extent although being part of the same biome. We adopt three conservation areas as study cases – namely Extractive Reserve Chico Mendes (Brazil), Manuripi-Heath Amazonian Wildlife National Reserve (Bolivia) and Tambopata National Reserve (Peru) – in which activities as tourism, extractivism of forest products, agriculture and large scale livestock farming differently affect the local ecosystems. Here we aim to use remote sensing technologies to evaluate temporal changes on the vegetation of the three sites, not merely in terms of gain or loss of tree cover, but to assess the vegetation structure, which can then be used as a proxy of ecosystem integrity/stability. To achieve this goal, we analyse and adapt the Forest Structural Condition Index (SCI) proposed by Hansen and collaborators in 2019, based on images captured by the satellites Landsat 7 and 8, as well as canopy height data developed by the Global Land Analysis & Discovery Lab (GLAD), and processed using Google Earth Engine. The index, originally developed with the reference date of 2012, will be updated with more recent data available for 2020, therefore allowing analyses of temporal changes during the given timeframe. Such assessment aims to provide a landscape-level understanding of the of the state of preservation of the three sites, which is especially relevant on a perspective that considers, besides the ecological sphere, the other components and actors that interact within a highly interconnected social-environmental-economical system.

Keywords: Amazon, forest structure, land-use change, remote sensing

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