Modeling forest restoration potential in Indonesia with G4M

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Indonesia experiences significant economic growth based on natural and planted forests. To sustainably meet the growing demand of forest products, an understanding of the economic and environmental contributions of current and future forest cover is pivotal. The Global Forestry Model (G4M, www.iiasa.ac.at/g4m [http://www.iiasa.ac.at/g4m]) is a biophysical model that predicts carbon stock, net primary productivity, increment, potential harvest and optimizes rotation time with a resolution of 1,10 or 50 km. The model uses monthly weather records or projections and soil information as input and considers various management options. As part of the Restore+ project (http://www.restoreplus.org/ [http://www.restoreplus.org/]), a regionalized version of the G4M was developed for Indonesia in order to simulate forest productivity. The model considered plantations for timber (represented by Tectona grandis, Paraserianthes falcataria and Swietenia macrophylla); plantations for pulp&paper (Acacia mangium, Eucalyptus pellita and *E. grandis*); non-assisted and assisted restoration on dryland (secondary forest); and assisted restoration on peatland (Dyera polyphylla, Shorea balangeran and Coffea liberica). The model was calibrated based on observations found in the literature and results of a plot-based bio-geochemical model (BGC-MAN, www.iiasa.ac.at/BGC-MAN [http://www.iiasa.ac.at/BGC-MAN]). Using the spatially-explicit economic model GLOBIOM, estimates of G4M on current and potential locations of forest production are evaluated against competing land uses of the AFOLU-sector with the aim to satisfy a growing world demand. G4M estimates on forest carbon stocks are combined with emissions from the AFOLU-sector, enabling GLOBIOM to analyze to what extent and under what forestry-related policies Indonesia is able to meet its environmental targets.

Management potential of secondary tropical cloud forests: implications for Mexico

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Tropical Montane Cloud Forests are of high strategic value for sustainable development due to theirexceptional diversity and their role in the provision of ecosystem services; however, they are threatenedby deforestation, climate change and overharvesting. Secondary cloud forest (SCF), a dominant component in cloud forest landscapes, could contribute to the provision of timber and ecosystem services. However, there is limited information regarding their potential for sustainable management via selective logging by smallholders.We both summarize the research and identify knowledge gaps through an expert review of the structure and dynamics of SCF and the out comes of silvicultural interventions in the Neotropics, and analyse the main constraints and potential benefits of their managementin Mexico. High heterogeneity in structure characterizes SCF and, as succession progresses, total stem density tends to decrease and the forest increases in height, basal area, timber volume and dominance of late successional species. In Mexico, the main benefits of planned selective logging in SCF could include the provision of timber and firewood at a sustainable rate, maintenance of continuous forest cover and management of biodiversity. Themain challenges are thesmall commercial timber volume, the lack of legal definitions for secondary forests and the absence of effective policy instruments and economic incentives for small-scale landowners. Given the high intrinsic heterogeneity of SCF and the important socioeconomic variation that exists among regions in Mexico, the requisites for management should be flexible to allow adjustment to regional variations, thus allowing the inclusion of adaptive management.

Tropical forest restoration and rehabilitation management in Malaysia: opportunities and challenges

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Malaysia has been endowed with a beautiful tropical forest which provides various ecosystem services such as carbon dioxide absorption, water supply and soil stabilization to the community. It is also a timber source for wood-based industries generating RM22 billion in 2016. However, there are illegal encroachment activities in the forests causing the forests to be degraded as well as conversion of land use to agriculture. The enforcement activities carried out by the authorities have resulted in the degraded areas being reclaimed and the forest areas are being restored with planting of local species with commercial value. To date many degraded forest areas have been restored using different approaches. This paper aims at presenting Malaysia's experiences and initiatives in forest restoration and rehabilitation of degraded forests. These activities have created opportunities to improve the forest ecosystem. There are also many challenges need to be addressed in order the forest restoration and rehabilitation to be successful. These challenges will also be discussed.

Active versus passive restoration: recovery of cloud forest structure, diversity and soil condition in abandoned pastures

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Tropical montane cloud forest is a priority ecosystem for restoration due to its high diversity and the provision of ecosystem services. We assessed the effectiveness of active (mixed plantation with native species) and passive (areas adjacent and non-adjacent to mature cloud forest) restoration strategies implemented in pastures with 21 years of exclosure, and compared these to a mature cloud forest, in Mexico. Active restoration proved more effective than passive restoration at recovering forest structure (higher basal area and tree height). Adult tree diversity was similar across all sites, while composition differed greatly between the mature forest and each of the restoration sites. The restoration sites presented very low tree seedling density (0.39 individuals/m^2) relative to the mature forest (1.68 seedlings/m^2), probably due to the higher cover of competing vegetation in the restoration sites. In all of the restoration sites, soil pH was higher, and carbon content in the soil and litter was lower, than in the mature forest. In general, the passive restoration site non-adjacent to the forest presented the lowest recovery, indicating the importance of proximity to seed sources. Our results highlight the need, in both actively and passively restored areas, for management practices, in order to assist tree seedling recruitment of key species and recovery of forest attributes. Active and passive restoration strategies could be implemented as complementary strategies for the restoration of cloud forest landscapes.