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“Bridging the gap between increasing knowledge and decreasing resources”

## The Impact of Forest Degradation: Recovery of Carbon Stocks and Tree-Species Diversity under Forest Conservation

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### Abstract

It is evident that forest degradation affects the diversity and structure of the Congo Basin rainforests. Yet actual carbon and biodiversity implications of forest degradation are less well known than those of deforestation. Biodiversity plays an important role in climate regulation as it potentially influences forest biomass production and thus determines the forests' capacity for carbon sequestration. Particularly with regard to REDD+ as an opportunity to support forest conservation through climate change mitigation funding, robust information on the effects of degradation on the carbon storage capacity and the forest restoration potential after disturbances is fundamental. Against this backdrop, this study examines the impact of repeated selective timber harvesting, the dominant driver of forest degradation in the Congo-Basin forest, on key forest properties as well as on forest structure and tree-species diversity. It further highlights the regeneration potential of an exploitation forest under protection. Thus, this study makes an important contribution to increase knowledge on the long-term implications of forest degradation in the Congo Basin. The study analysis is based on forest data recorded in 1993 and 2011. Additional information on mature rainforests serves as benchmark for assessing the state of the forest. Data analysis proves the ongoing forest recovery. After 40 years of natural regeneration, stem counts, basal area, forest biomass and carbon stocks approximate those of mature forests in the region. Signs of selective logging persist in the horizontal and vertical forest structure. In addition, repeated exploitations had led to a decline in forest diversity. Resource overuse and local extermination of certain animal and plant species impedes the natural tree species recovery. However, the results suggest that in the present case declining biodiversity has no long-term effects on the biomass carbon stocks. Since most of the carbon in tropical forests is stored in the stems, increasing timber volume due to proceeding forest maturation directly results in carbon benefits. On account of this, the study concludes that under proper forest management the restoration of essential ecosystem functions and services (e.g. biomass production and carbon storage) comparable to primary levels is possible.

**Keywords:** Biodiversity, forest carbon stocks, forest conservation, forest degradation, forest restoration, REDD+