

Analysis of the Environmental Impacts of Sustainable Logging Practices in Sarawak: A Before-And-After Comparison in a Raplex FMU Lowland

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Structured Abstract:

Background: Reduced Impact Logging (RIL), buffer zones, and retention of mother trees are taking centre stage in ensuring that sustainable forest management is integrated with environmental conservation. The short-term ecological impacts of these techniques, however, are not well studied. This study investigates the effects of sustainable logging on carbon stocks and biodiversity within the Raplex FMU of Sarawak, comparing logged, buffer, and unlogged regions.

Methods: This was carried out in the Coupe 6 Raplex Forest Management Unit (FMU) in Sarawak. There were 24 circular plots (radius = 20 meters) logged, buffer, and unlogged areas. Data on tree species, DBH, and height were collected and used in allometric equations to estimate Above-Ground Biomass (AGB) and carbon stock. The Shannon-Wiener Diversity Index and species evenness were used to determine biodiversity. To estimate differences in carbon stock and tree density, a one-way ANOVA was applied, and to estimate the association between species diversity and carbon stock, a linear regression was run.

Results: The carbon stock calculations did not indicate a significant difference between the logged and unlogged plots ($p = 0.584$), meaning that sustainable logging did not reduce biomass due to the retention of mother trees. The density of trees was not significant. There was a stable distribution of biodiversity between the zones with 24 registered species, $H = 2.277$ and $E = 0.7165$. The linear regression analysis identified a positive and significant correlation between biodiversity and carbon stock ($p = 0.020$, $R^2 = 43.39\%$), indicating that more diverse areas contain greater carbon stocks.

Conclusion: In this research study, there was no observed maintenance of carbon stocks and species diversity under sustainable logging in the Raplex FMU, with respect to the differences between logged and unlogged plots. The buffer zones were important in the preservation of canopy cover and biodiversity. Most outcomes were positive, indicating a positive relationship between diversity and carbon stock ($p = 0.020$, $R^2 = 43.39\%$). In general, sustainable logging may align with conservation objectives when supported by proper planning, monitoring, and management practices in the forest.

Keywords: sustainable logging, carbon stock, biodiversity, buffer zone, Sarawak

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