

Governments around the world are increasingly invoking hydrological services, such as flood mitigation and water purification, as a justification for forest conservation programs in upstream areas. Yet, rigorous empirical evidence that these programs are actually delivering the intended services remains scant. We investigate the effect of deforestation on flood-mitigation services in Peninsular Malaysia during 1984–2000, a period when detailed data on both flood events and land-use change are available for 31 river basins. Floods are the most common natural disaster in tropical regions, but the ability of tropical forests to mitigate large-scale floods associated with heavy rainfall events remains disputed. We find that the conversion of inland tropical forests to oil palm and rubber plantations significantly increased the number of days flooded during the wettest months of the year. Our results demonstrate the importance of using disaggregated land-use data, controlling for potentially confounding factors, and applying appropriate estimators in econometric studies on forest ecosystem services.

Abstract

Ecosystem information on the Colombian Amazonia is poor in comparison with that on the Brazilian Amazon. We examined patterns of ecosystem diversity, deforestation and fragmentation and provided an estimate on their possible causes through a temporal and spatial analysis of biotic and abiotic data using remote sensing and geographical information systems in six pilot areas covering a total of 4,200,000 ha. Ecological, demographic and socio-economic data were analysed to establish the local conditions. We used a landscape ecology approach to calculate indicators of ecosystem diversity, cover and forest fragmentation such as number of patches, mean patch size, mean shape index and mean nearest neighbour distance. Patterns of deforestation did not run parallel to access roads; instead the typical pattern of unplanned colonization follows the only transportation network existing in many areas in the Colombian Amazonia: rivers. In addition, we have used indicators of human influence such as demographic pressure, quality of life and economic activity indicators. Results show that the extent and rate of change varies between areas depending on population density. Annual deforestation rates were 3.73 and 0.97% in the high population density growth areas of Alto Putumayo and Macarena respectively, and 0.31, 0.23, and 0.01% in the relatively unpopulated areas of indigenous population. These changes are related to land use history as well as to environmental and historical socio-economic factors such as oil extraction, deforestation, cattle ranching or illegal cropping. The current situation in the region suggests that tropical deforestation rates in the Colombian Amazon are substantially higher than those found in previous studies in the rest of the Amazon.