Environmental Monitoring and Assessment
November 2008, Volume 146, Issue 1-3, pp 147-156

Impact of land use and land cover changes on ecosystem services in Menglun, Xishuangbanna, Southwest China

Abstract

Changing the landscape has serious environmental impacts affecting the ecosystem services, particularly in the tropics. In this paper, we report changes in ecosystem services in relation to land use and land cover over an 18-year period (1988–2006) in the Menglun Township, Xishuangbanna, Southwest China. We used Landsat TM/ETM and Quickbird data sets to estimate changes in ten land use and land cover categories, and generalized value coefficients to estimate changes in the ecosystem services provided by each land category. The results showed that over the 18-year period, the land use and land cover in the study area experienced significant changes. Rubber plantations increased from 12.10% of total land cover to 45.63%, while forested area and swidden field decreased from 48.73 and 13.14 to 27.57 and 0.46%, respectively. During this period, the estimated value of ecosystem services dropped by US $11.427 million (~27.73%). Further analysis showed that there were significant changes in ecological functions such as nutrient cycling, erosion control, climate regulation and water treatment as well as recreation; the obvious increase in the ecological function is provision of raw material (natural rubber). Our findings conclude that an abrupt shift in land use from ecologically important tropical forests and traditionally managed swidden fields to large-scale rubber plantations result in a great loss of ecosystem services in this area. Further, the study suggests that provision of alternative economic opportunities would help in maintaining ecosystem services and for an appropriate compensation mechanisms need to be established based on rigorous valuation.

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Journal
Environmental Monitoring and Assessment
Volume 146, Issue 1-3 , pp 147-156
Cover Date
2008-11-01
DOI
10.1007/s10661-007-0067-7
Print ISSN
0167-6369
Online ISSN
1573-2959
Publisher
Springer Netherlands
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