

Possible consequences of integrating ecosystem services into tropical land-use planning

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Abstract:

Economic risks and opportunities are among the most important drivers of land-use/land-cover change, which is often associated with deforestation in tropical landscapes. Deforestation causes a tremendous loss of biodiversity. Integrating multiple nonmarket-based ecosystem services (ES) in land-use planning could mitigate deforestation, as natural forests store a lot of carbon and contribute important hydrological and climatic services. However, the actual consequences of addressing multiple and usually uncertain ES in land-use planning are so far understudied. This presentation uses extensive data from a long-term multidisciplinary research initiative in the mega-diverse Andes of Ecuador to inform a multiple objective approach to land-use optimization. The optimization covers various perspectives in decision-making, while considering also the uncertainty of the indicators for ES. The results for the Ecuadorian study case show that the integration of multiple ES in decision-making may lead to an initial acceleration of deforestation. In a tropical forested landscape that currently still has a rather large natural forest cover of 50%, the consideration of multiple and uncertain ES in land-use planning suggests enhanced landscape compositional diversity, which is in charge for an initially increased loss of tropical forests. Accounting for multiple ES saves some forest only in the distant future, when the natural forest cover stabilizes at less than 20%. However, when accounting for biodiversity directly, through indicators for vascular plant diversity, the simulated land-use planning reduces deforestation immediately and significantly. The presentation concludes that incorporating multiple ES into land-use planning does not automatically lead to the conservation of natural forest, if the landscape under consideration still holds a significant proportion of natural forests. However, in more anthropogenic landscapes, which have already undergone a more significant loss of forests, addressing multiple ES may save the already reduced forest area effectively.

