



Modeling the impact of land-use change on ecosystem services and biodiversity in a mountainous watershed



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Introduction

The concept of ecosystem services (ESS) has been increasingly recognized for its potential in decision making processes regarding environmental policy and land use planning. In South-East Asia, large scale land use conversions from secondary forest to rubber plantations lead to extensive impacts on biodiversity, the hydrological cycle and environmental functions. Spatially explicit modeling, mapping and analyses of ESS are essential parts in the development of strategies for sustainable ESS supply. Therefore, we applied the InVEST modeling toolset to assess the impact of rubber expansions on the supply of ESS in South-Western China (Xishuangbanna).

Objectives

A) Development of potential future land use scenarios in collaboration with regional stakeholders

Methods

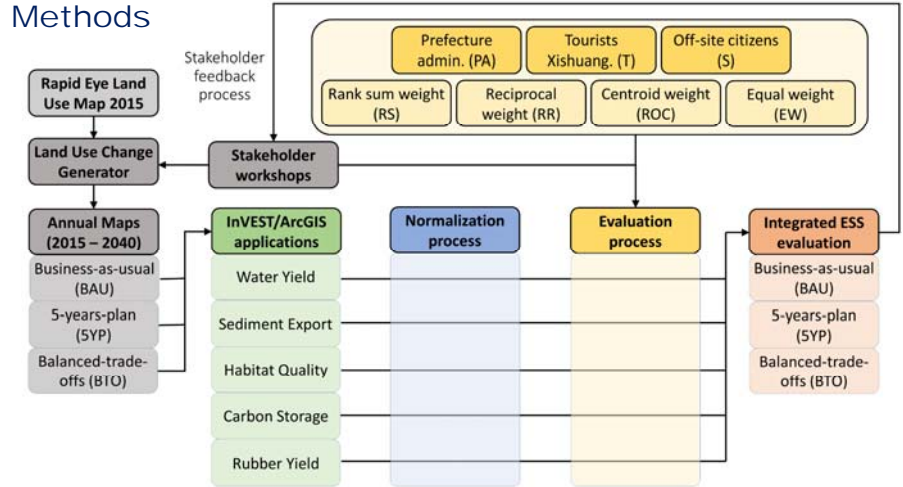


Figure 1: Conceptual scheme of our applied methodological framework for iterative land use scenario development, ESS assessment and scenario evaluation.

B) Modeling the impact of the land use scenarios of the provisioning of five selected ESS (with InVEST)

C) Evaluating the biophysical model results using stakeholder feedback on ESS preservation preferences

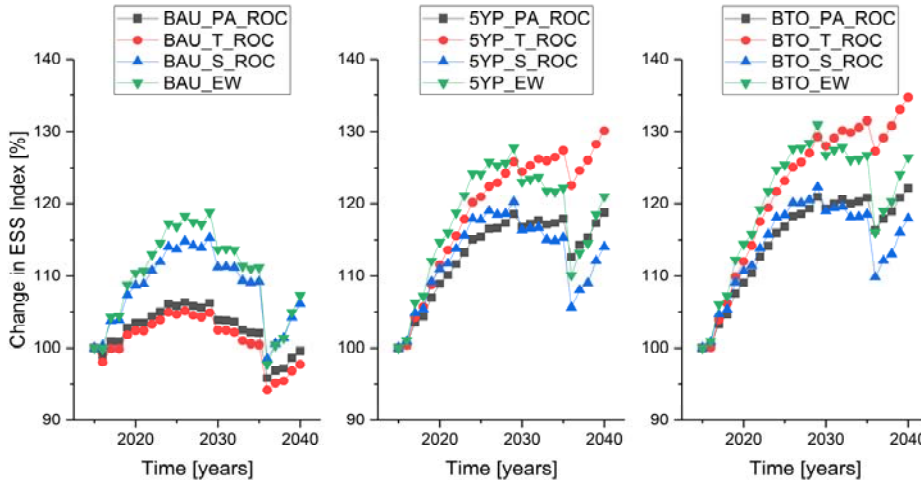


Figure 2: Integrated ESS Index for three possible future land use scenarios of rubber expansion (BAU: Business as usual, 5YP: 5 years plan, BTO: Balanced Trade-Offs) as evaluated by three stakeholder groups (PA: Prefecture Administration, T: Tourists, S: Off-site Citizens, EW: Equal weights (neutral control)).

Results

- Rubber expansion reduced water yield and high quality habitat areas but increased rubber yields and sediment loads to the stream system (Business-as-usual scenario)
- The Balanced-trade-off scenario (BTO, reforestation of bushland areas, restricted rubber expansion on low altitudes and moderate slopes (<23°)) lead to the highest integrated ESS Index trajectories compared to the other two scenarios

Conclusions

- The inclusion of stakeholders is crucial to ensure the validity of assessed land use change scenarios
- The trade-off between agricultural intensification and environmental protection can be buffered with sophisticated land use planning on a watershed scale



Figure 3: Typical landscape in Xishuangbanna Prefecture, Yunnan Province, China.

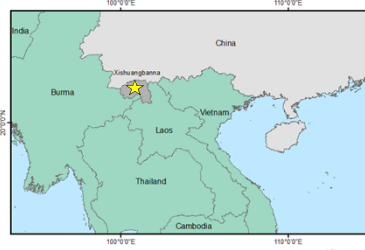


Figure 4: Location of the study area: The Naban River Watershed National Nature Reserve.



Figure 5: Rubber plantation in the Naban River Watershed National Nature Reserve.

