

Collaborative Governance of Forests

Towards Sustainable Forest
Resource Utilization

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Chapter 10

Simulating Future Land-cover Change

A Probabilistic Cellular Automata Model approach

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1. Introduction

1.1. Why do we have to Predict Future LULCC?

Understanding the human- or climate-induced changes in a tropical environment requires knowledge of the current status of landscape, the extent of land-cover types vulnerable to change, and the causes and impacts of such changes. Monitoring land-use and land-cover change (LULCC) is definitely the very first step for understanding the past and current states of our environment. Time series and accurate change detection of the Earth's surface features provides historical land-cover change information as a result of interactions between human and natural phenomena.

Knowledge of historical land-cover change preserves important information to foresee future changes using a modeling approach. Modeling and simulating land-cover change can provide an outlook of what, where, why, and how to mitigate future LULCC under any condition. Moreover, modeling approach is a prerequisite under the post-Kyoto Protocol climate change mitigation regime, for example, Reducing Emissions from Deforestation and Forest Degradation Plus (REDD-plus), for forecasting business-as-usual emission or reference emission level.

On the other hand, from the perspective of local people, they cannot clearly recognize LULCC even though they are familiar with the land area. Although the change gradually proceeds over a long time, They say "Oh! I did not know the landscape was changing so much like this!". Hence, it will surely be difficult for them to imagine LULCC for a wide area of several hundred km². Furthermore, when they are requested to express their own opinion at government-organized group meetings that explain future land use policy alternatives orally or by paper, it is conceivably very difficult for local people to concretely predict by themselves the manner in which each policy alternative will affect their living environment and surrounding landscape. To make land-use plans comprehensible to (and encourage the involvement of) the local people, it is desirable that local people understand, first, the LULCC in the area from past to present; second, why such changes occurred and