

Impact and Risk Assessment of Land Use Change on Ecosystem Services and Livelihood Security in Saysathan District, Sayaboury Province, Lao PDR

Author	Bouavonh Biachampah
Country	Lao PDR
University	Chiang Mai University
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Abstract

It is widely recognized that land use changes are affecting provision of ecosystem services as well as people's livelihoods, especially in rural areas where people are highly dependent on local ecosystem services. This study employed a combination of spatiotemporal analysis, the Sustainable Livelihood approach (SL), Participatory Rural Appraisal (PRA), and household survey to detect land use change and its drivers as well as to assess impact and risk of land use change on provisioning ecosystem services and livelihood security of rural highland villages namely, Doykao and Paklong in Saysathan district, Sayaboury province, Lao PDR.

Two temporal Landsat images, Landsat 5 Thematic Mapper (TM), and Landsat 8 Operational Land Imager/Thermal Infrared Sensor (OLI/TIRS), acquired on February of 2005 and 2014 respectively were used for land use change analysis in this study. The analysis addresses four major land use categories that are highly attached to livelihood of the studied communities; forest area, upland rice field, fallow, and urban, or residential area. The results in both Doykao and Paklong villages highlighted a large decrease in forest areas from 1,388.34 ha and 2,069.92 ha in 2005 to 670.66 ha, and 1,511.24 ha in 2014 respectively. These results are consistent with the perception of the local residents that address "moderate" to "high" degrees of land use changes. The responses from the focus group discussions and the household survey indicate that these changes in land use have been primarily driven by the government's policies, increasing population, and forest fire which was caused by human activity, specifically upland rice farming.

The reduction of forest area was associated with significant decline of provisioning Ecosystem Services (ES) and changes in livelihood security of local communities. The household survey conducted with a total of 70 sampled households revealed that the overall index value of provisioning ecosystem services in both Doykao and Paklong villages were decreased from 0.921 and 0.892 in 2005 to 0.426, and 0.450 in 2014 respectively. The decline in provisioning ecosystem services also influenced the state of livelihood security, especially natural capital which concurrently decreased in the two villages from the values of 0.779 and 0.737 in 2005 to 0.357, and 0.394 in 2014 respectively. However, composite indices of both villages similarly increased from 0.567 and 0.757 in 2005 to 0.579, and 0.740 in 2014 respectively. These indicate that the condition of livelihood security of the selected communities has considerably improved from "moderate" to "good" during the past decade.

Three future scenarios namely “Business As Usual” (BAU), “Desirable Future” (DF), and “Undesirable Future” (UDF) were collectively developed to find out potential risks on provisioning ecosystem services and livelihood security of local communities. This finding highlights that the stakeholders were able to envisage the future directions of their community and livelihood development. Strong concerns were similarly given on the degradation of land and forest resources, which were perceived as the main sources for food and income of the locals.

This study suggests that it is essential to integrate ecosystem service aspects, i.e. natural capital, in the development planning to maintain and use these resources in a sustainable way. Alternative activities for income and food should be supported. In addition, it is vital to give different stakeholders the opportunity to participate in key decisions. The local state sectors in charge of policy implementation should take into account the connection among the five livelihood capitals, as well as the policy and institutional structure as clearly stated by the SL approach. They should also mainstream the approach into the process of the rural development planning. Simultaneously, this concept should be cascaded and disseminated into the local development planning to derive the robust and sustainable future plan.